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Abstract

The preservation, or conservation of digital art confronts us with a range of challenges, eclipsing many of the difficulties posed by more mainstream digital resources like documents and images. In this, *digital* art is not alone, with many of the most critical questions shared by conservators of contemporary art more generally. Issues of context, of interpretation and perceived value are all critical, but rarely clear cut. Preservation of art may itself be an impossible goal; instead, one might realistically aim only to create and collate sufficient documentation capable of conveying meaning and impact to a future audience, with perhaps one eye on its recreation where necessary at a later date.

Keyword list

Digital art; conservation; contextual classification; characterisation vocabulary; variable media

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References

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1.	Alonso, R. This is not an advertisement: An Essay on Muntadas' work in video and internet.	1998	Rodrigo Alonso Personal Website Retrieved June 1, 2009, from http://roalonso.net/en/videoarte/muntadas.php
2.	Becker, C., Rauber, A., Heydegger, V., Schnasse, J., Thaller, M. A Generic XML Language for Characterising Objects to Support Digital Preservation	2008	SAC 08: Proceedings of the 2008 ACM Symposium on Applied Computing 402 – 406
3.	Benedictus, L. Here today, gone tomorrow?	2004	The Guardian Online. Retrieved June 2 2009, from http://www.guardian.co.uk/artanddesign/2004/oct/09/friezeartfair2005.friezeartfair2
4.	Berndes, Christiane. New registration models suited to modern and contemporary art.	1999	Modern Art: Who Cares? An Interdisciplinary Research Project and an International Symposium on the Conservation of Modern and Contemporary Art. Ed. Ysbrand Hummelen and Dionne Sillé. Amsterdam: Stichting Behoud Moderne Kunst / Instituut Collectie Nederland, 1999.
5.	Bertelsen, O. W., & Pold, S. Criticism as an approach to interface aesthetics.	2004	Paper presented at the Third Nordic Conference on Human-Computer Interaction, Tampere, Finland.
6.	Berwick, C. The new new-media blitz.	2001	ARTnews Online.
7.	Bolter, J. D., & Grusin, R. Remediation: Understanding New Media.	1999	Cambridge, Mass.: MIT Press.
8.	Candy, L., & Edmonds, E. Explorations in Art and Technology.	2002	London: Springer.
9.	Castle, N. Internet Art and Radicalism in the Digital Culture Industry	2000	Retrieved May 15, 2009, from http://video.lulu.com/items/volume_1/89000/89324/2/preview/netart_preview.pdf

10.	Catalogue Marcel Broodthaers	1974	Vereniging voor Tentoontellingen van het Paleis voor Schone Kunsten, Brussels (Dutch version translated from the French by Marian Verstraeten)
11.	Consultative Committee on Space Data Systems, Reference Model for an Open Archival Information System	2002	CCSDS 650.0-B-1, Blue Book, ISO 14721:2003, available from http://public.ccsds.org/publications/archive/650x0b1.pdf (available 10 September 2009)
12.	Cornwall, R. From the Analytical Engine to Lady Ada's Art.	1993	In T. Druckrey & C. Stainback (Eds.), Iterations: the New Image. Cambridge, MA; London: MIT Press.
13.	Coulter-Smith, G. Deconstructing Installation Art.	2006	Available from http://www.installationart.net/
14.	Class Hierarchy for Final Capturing Unstable Media Conceptual Model	2003	http://framework.v2.nl/v2_archive/projects/capturing/cmcm/html/
15.	Crown, M., That Was Then: Documenting Transient Art	2007	The Harvard Crimson, available at http://www.thecrimson.com/article.aspx?ref=518592) (available on 23 July 2009)
16.	Dappert, A., Ballaux, B., Mayr, M., van Bussel, S. Report on Policy and Strategy Models for Libraries, Archives and Data Centres	2008	PLANETS report PP2-D2 available from http://www.planets-project.eu/docs/reports/Planets_PP2_D2_ReportOnPolicyAndStrategyModelsM24_Ext.pdf (available on 10 September 2009)
17.	Dappert, A., Farquhar, A., Significance is in the Eye of the Stakeholder	2009	In the proceedings of European Conference on Digital Libraries (ECDL) 2009, Corfu, Greece
18.	Decker-Phillips, E. Paik video. Barrytown, N.Y	1998	Barrytown, Ltd.
19.	Dietz, S. Collecting New Media Art: Just Like Anything Else, Only Different.	2005	In B. Altshuler (Ed.), Collecting the New: Musems and Contemporary Art (pp. 85-101). Princeton, N.J.: Princeton University Press.
20.	Dutton, D. Aesthetic Universals.	2008	In B. N. Gaut & D. Lopes (Eds.), The Routledge companion to aesthetics (2nd ed., pp. 279-291). London; New York: Routledge.
21.	Gray, Stephen. Conservation and Performance Art, Building the Performance Art Data Structure (PADS)	2008	MA Dissertation, available from International Network for the Conservation of Contemporary Art (INCCA) at http://www.incca.org/files/pdf/resources/2008_gray_stephen._conservation_and_perfomance_art.pdf (available 10 September 2009)
22.	Greene, R. Internet Art.	2004	London ; New York: Thames & Hudson.
23.	Green, D., Mustalish, R., Digital Technologies and the Management of Conservation Documentation	2009	Survey Commissioned by the Andrew W. Mellon Foundation
24.	Hansen, A., Life in Destruction	1966	Art and Artists, vol. 1, no. 5 (August 1966), p. 33.
25.	Heslop, H., Davis, S., Wilson, A. An Approach to the Preservation of Digital Records	2002	National Archives of Australia, available from http://www.naa.gov.au/Images/An-approach-Green-Paper_tcm2-888.pdf (available on 10 September 2009)
26.	Hummelen. I., Sillé, D, Modern Art: Who Cares? Archetype	2005	First published 1999
27.	Hunter, J., Choudry. S Implementing Preservation Strategies for Complex Multimedia Objects	2003	ECDL 2003 Trondheim, Norway. August 2003. pp 473-486. doi:10.1007/b11967
28.	Indiana University Digital Music Library Data Model Specification V2	2003	Variations2 Project, available from http://www.dml.indiana.edu/pdf/DML-DataModel-V2.pdf (available 10 September 2009)
29.	Inside Installations, Inside Installations 2007 Booklet	2007	Retrieved May 12, 2009, from http://www.incca.org/files/pdf/projects_archive/2007_Inside_Installations_booklet.pdf
30.	Inside Installations Data Model (2IDM)	2007	Project group 'Documentation of Contemporary Art' within the German Conservators Association (Verband der Restauratoren) available from http://www.inside-installations.org/OCMT/mydocs/A_1_Data-Model.pdf; http://www.inside-installations.org/OCMT/mydocs/A-2_Data-Model-Legend.pdf; and http://www.inside-installations.org/OCMT/mydocs/A-3_Basic-Modules.pdf (All available on 10 September 2009)
31.	Ippolito, J. Accommodating the Unpredictable: The Variable Media Questionnaire	2003	Guggenheim Permanence through Change: The Variable Media Approach. New York: Guggenheim Museum, available from
32.	Ippolito, J. Deconstruction or Distraction?	1999	Artbyte (New York), 2(1), 22-23.
33.	Ippolito, J., Rinehart, R., Lutz, M., and Fitzgerald, S. Forging the future: new tools for variable media art	2009	In Proceedings of the 9th ACM/IEEE-CS Joint Conference on Digital Libraries (Austin, TX, USA, June 15 - 19, 2009). JCDL '09. ACM, New York, NY,

	preservation		403-404. DOI= http://doi.acm.org/10.1145/1555400.1555484
34.	Kaprow, A. "Happenings" in the New York Scene.	2003	In N. Wardrip-Fruin & N. Montfort (Eds.), The New Media Reader (pp. 83-88). Cambridge, Mass.; London: MIT Press.
35.	Kling, R. Defining the Boundaries of Computing across Complex Organisations.	1987	In R. J. Boland & R. A. Hirschheim (Eds.), Critical Issues in Information Systems Research (pp. 307–362). Chichester; New York; Brisbane; Toronto; Singapore;: John Wiley & Sons.
36.	Knight, G. Framework for the Definition of Significant Properties	2008	inSPECT Project WP 3.3, available from http://www.significantproperties.org.uk/documents/wp33-propertiesreport-v1.pdf (available on 10 September 2009)
37.	Liao, C. L. Avatars, Second Life®, and New Media Art: The Challenge for Contemporary Art Education.	2008	Art Education, 61(2), 87-91.
38.	Lichty, P. The Cybernetics of Performance and New Media Art.	2000	LEONARDO, 33(5), 351-354.
39.	Lombardo, V., Valle, A., Nunnari, F., Giordana, F., & Arghinenti, A. Archeology of multimedia.	2006	Paper presented at the 14th annual ACM international conference on Multimedia.
40.	Manovich, L. New Media from Borges to HTML.	2003	In N. Wardrip-Fruin & N. Montfort (Eds.), The New Media Reader (pp. 13-25). Cambridge, MA; London: MIT Press.
41.	McQueen, M. P. Perishable Art: Investing In Works That May Not Last.	2007	Wall Street Journal, p. D.1. Retrieved June 2 2009, from http://online.wsj.com/article/SB117927768289404269-email.html
42.	Middlebrooks, K. New Media Art: A New Frontier or Continued Tradition?	2001	Project Zero: Harvard University.
43.	Morris, S. Museums and New Media Art	2001	Retrieved May 12, 2009, from http://www.math.vu.nl/~eliens/research/onderwijs/multimedia/imm/college/@archive/refs/Museums_and_New_Media_Art.pdf
44.	Paul, C. Digital Art	2003	Thames and Hudson
45.	Paul, C. Challenges for a Ubiquitous Museum: Presenting and Preserving New Media	2004	Retrieved May 12, 2009, from http://hdl.handle.net/10002/305
46.	Planets XCL OWL Ontology (work in progress)	2009	Available from http://planetarium.hki.uni-koeln.de/public/XCL/ontology/XCLOntology.owl
47.	Polioni, O. Life doesn't last, art doesn't last, it doesn't matter	2005	Published by International Network for the Conservation of Contemporary Art available from http://www.incca.org/theory-and-ethics/301-polioniarticle2005 (available 10 September 2009)
48.	Popper, F. Art of the Electronic Age.	1997	New York: Thames & Hudson.
49.	Powell, J.D., Preserving the unpreservable: A study of destruction art in the contemporary museum	2007	Published by International Network for the Conservation of Contemporary Art available at http://www.incca.org/theory-and-ethics/422-powell-ma-dissertation (available 10 September 2009)
50.	Rinehart, R. A System of Formal Notation for Scoring Works of Digital and Variable Media Art	2005	Published within the Archiving the Avante Garde Project – see http://www.bampfa.berkeley.edu/about/avantgarde (available 27 July 2009)
51.	Rugg, J., & Sedgwick, M. (Eds.). Issues in Curating Contemporary Art and Performance.	2007	Bristol, UK ; Chicago: Intellect Books.
52.	Rusbridge, C., Excuse me… Some Digital Preservation Falacies?	2006	Ariadne, 46., ISSN 1361-3200 available from http://www.ariadne.ac.uk/issue46/rusbridge (available 10 September 2009)
53.	Rush, M. New Media Art.	2005	New York: Thames & Hudson.
54.	Schlichtiger, P. Closely coupled systems	1991	Operating Systems of the 90s and Beyond (pp. 44-47). Berlin; Heidelberg: Springer.
55.	Strehovec, J. New media art as research: art-making beyond the autonomy of art and aesthetics.	2009	Technoetic Arts: a Journal of Speculative Research, 6(3), 233-250.
56.	Strodl, S., Becker, C., Neumayer, R., and Rauber, A. How to choose a digital preservation strategy: evaluating a preservation planning procedure	2007	In *Proceedings of the 7th ACM/IEEE-CS Joint Conference on Digital Libraries* (Vancouver, BC, Canada, June 18 - 23, 2007). JCDL '07. ACM, New York, NY, 29-38. DOI= http://doi.acm.org/10.1145/1255175.1255181
57.	Šukaityte, R. New Media Art in Lithuania.	2008	Athena: Philosophical Studies, 3, 173-186.
58.	Thaller, M., Heydegger, V., Schnasse, J., Beyl, S., Chudobkaite, E., Significant Characteristics to Abstract Content: Long Term	2008	In Proceedings of the 12th European Conference on Research and Advanced Technology For Digital Libraries (Aarhus, Denmark, September 14 - 19, 2008). B. Christensen-Dalsgaard, D. Castelli, B.

	Preservation of Information		Ammitzbøll Jurik, and J. Lippincott, Eds. Lecture Notes In Computer Science, vol. 5173. Springer-Verlag, Berlin, Heidelberg, 41-49. DOI= http://dx.doi.org/10.1007/978-3-540-87599-4_5
59.	Tribe, M., & Reese, J. New media art.	2006	Taschen. ISBN: 3822830410
60.	V2_Organisation, Capturing Unstable Media, Deliverable 1.2, Documentation and Capturing Methods for Unstable Media Arts	2003	http://archive.v2.nl/v2_archive/projects/capturing/1_2_capturing.pdf (available 10 September 2009)
61.	V2_Organisation, Capturing Unstable Media, Deliverable 1.3, Description Models for Unstable Media Arts	2003	http://archive.v2.nl/v2_archive/projects/capturing/1_3_metadata.pdf (available 10 September 2009)
62.	Van de Wetering, E., and van Wegen D.H Roaming the Stairs of the Tower of Babel; efforts to expand the interdisciplinary involvement in the theory of restoration	1987	In Preprints for the 8th Triennal Meeting, ICOM Committee for Conservation Volume II pp. 561-565
63.	Wands, B, Art of the Digital Age	2006	New York, Thames and Hudson
64.	Wardrip-Fruin, N., & Montfort, N. (Eds.). The New Media Reader.	2003	Cambridge, Mass. ; London: MIT Press.
65.	Weight, J. I, Apparatus, You.	2006	Convergence: Technologies, 12(4), 413-446. The International Journal of Research into New Media
66.	Wijers, G. 3D Documentation of Installations	2007	http://www.inside-installations.org/OCMT/mydocs/3D%20Documentation%20of%20Installations.pdf
67.	Wijers, G. Preservation and/or Documentation: The Conservation of New Media Art	2005	Published in www.montevideo.nl/en/nieuws/detailC.php?id=72 (available 23 July 2009)
68.	Wijers, G. The Sustainability of Video Art		Published in http://www.montevideo.nl/en/pdf/CONSERVERING_1tm80.pdf (available 23 July 2009)
69.	Wysocka, E. Agatha Reappears: Net art Restoration Project	2008	Thesis available from http://www.incca.org/files/pdf/resources/wysocka_e._agatha_re-appears_net_art_restoration_project.pdf (Available 10 September 2009)
70.	Wetering, Ernst van de. Conservation-restoration ethics and the problem of modern art.	1999	Hummelen, IJ., Sillé, D., Modern Art: Who Cares?, Amsterdam: Foundation for the Conservation of Modern Art/ Netherlands Institute for Cultural Heritage, 1999, p. 247-249. Available in PDF format from http://www.incca.org/files/pdf/resources/van_de_wetering_e._conservation-restoration_ethics_and_the_problem_of_modern_art.pdf (Available 10 September 2009)
71.	Buneman, P. Why current database technology does not support preservation	2007	A Position Paper at the 2007 Workshop on Database Preservation, available from http://homepages.inf.ed.ac.uk/hmueller/presdb07/papers/ddb_buneman.pdf

EXECUTIVE SUMMARY

Planets deliverable PC5-D1 outlined a selection of core research areas for characterisation of digital art materials for preservation. This report explores some of these in greater detail, and reflects increasingly on existing trends and approaches within the creative curatorial domain. It considers the issue of creative context, exploring with reference to existing research a series of sliding scale classifiers that can describe and distinguish the contextual factors relating to the creation, exhibition and consumption of digital and contemporary art. Secondly, it offers some discussion surrounding art documentation, specifically focusing on some of the available decision making and documentation models for the conservation of contemporary art. The report's final phase offers a collective consideration of these issues, and aims to outline an infrastructure within which they may be combined to offer an optimal documentation approach for both artworks and their contexts. As well as summarising these issues, this section aims to direct the issues towards the mainstream preservation arena, speculating as to their applicability within a more generalised preservation characterisation approach.

TABLE OF CONTENTS

1. Introduction 8
2. Approaching a Vocabulary for Context Classification 10
3. Documentation of Intrinsic Aspects of Contemporary Art 20
3.1 Introduction 20
3.2 The Conservation of Modern Art Project 20
3.3 Variable Media Questionnaire 23
3.4 The Variations 2 Project 27
3.5 The Media Art Notation System 29
3.5.1 Introduction to MANS 29
3.5.2 The MANS Vocabulary 30
3.6 Forging the Future: New Tools for Variable Media Preservation 31
4. Art Conservation Practice and Planets 32
4.1 Summarising Opportunities for Contemporary Art Conservation 32
4.2 The Artist's Role… The Creator's Role 33
4.3 An Objective Approach to Preservation – All Things to All People 34
4.4 Mainstreaming the Discussion: Planets XCL 35
4.4.1 Introduction to XCL 35
4.4.2 Related Work 35
4.4.3 Limitations of XCL for Dynamic Materials 36
4.4.4 Requirements for a Planets Characterisation Language for Digital Art 38
4.4.5 Further Work 39

1. Introduction

As discussed in the earlier Planets deliverable (PC5-D1), the challenges associated with preservation (or to use the domain's preferred vocabulary, conservation) of contemporary art are potentially onerous. As pointed out by Bruce Wands [63], art communicates simultaneously on sensory, emotional, mental and spiritual levels. Its impact throughout these levels, and our comprehension of its value is based not just on factors intrinsic to the piece, but many additional contextual factors that may be permanent or transitory, localised or global and either physical or conceptual. Furthermore, those qualities associated more tangibly with works of contemporary art may be difficult to characterise. Contemporary art typically establishes and encourages greater levels of dialogue than the traditional fruits of creativity. Whereas paintings or sculptures are largely consumed in a passive manner by audiences, contemporary installations, and particularly those incorporating digital elements (most obviously net art), promote a high degree of often distributed user involvement. A sliding scale exists between the prioritisation of data centric characteristics, and those more concerned with the experiential qualities associated with a particular example. Meaning is less self evident; unlike more traditional art where the materials used are largely subservient to the implicit message it is commonplace within contemporary works for specific component materials to have tremendous implications for the overall meaning. These issues are shared by digital materials more generally – they regularly exhibit complexity of interpretation, consumption and application in excess of those physical materials with implicit, unambiguous usefulness. Of critical importance is the extent to which information and access methods are tightly or loosely coupled. As explored in the previous Planets deliverable there are numerous layers (both physical and conceptual) supporting encapsulation of and access to digital information, in contrast with analogue information, which is largely atomic. More layers introduce more complex dependencies, and the result is that any preservation action can have implications far in excess of the extent of the intervention. Rinehart expresses this in terms of the separability of the physical and the logical, which in turn creates opportunities for variation of behaviour and performance [50]. While this contributes towards, rather than detracts from, the significance and impact of the creative expression, it introduces difficulties to those seeking to characterise, and preserve that which is definitive.

A further complication is the often modular nature of contemporary installations, whereby components operate based on inputs from discrete linked systems. This introduces further levels of complexity for those seeking to ensure their longer term accessibility. Lynn Hershman Leeson's *Synthia* provides a good example, whereby an animated character onscreen responds physically to stock market data arriving from a live stream. Partially contextual, partially intrinsic, the flow of data must nevertheless be made persistent in order to enable the piece's correct exhibition. We see similar phenomena within the digital context more generally; applications and file formats are increasingly networked, and are more and more reliant on decentralised services. How we deal with the preservation challenges associated with maintaining third party services or user contributions is particularly challenging. Web archiving appears trivial when dealing with simple networks of linked, static web pages. When the relationships between scripts, users, web services, databases and rights management systems become more intricate and integral, preservation becomes less akin to photocopying and more like performing organ transplant surgery, with all of the risks that digital materials will be 'rejected' within their anticipated preservation environment.

The issues are neatly summarised within the report of the Conservation of Modern Art Project:

> "Works are similar to visual, rather than literary theatre. What is represented may be static, but it often consists of movement. With certain installations such as *Hok 1* (Cabin 1) by Suchan Kinoshita, museum visitors themselves add an extra dynamic to the work by inverting different-sized hourglasses containing various coloured fluids, in an enclosed space… Contemporary artists use their often unconventional materials in a highly personal way. There is now no general consensus as to the symbolic meanings of a material or its value. So conservators can easily make mistakes. Any intervention involving the materials or techniques of the artist has implications for the meaning of the work… But the aim of the museum is to display the work of art just as the artist created it. The original material is important. This is a typical aspect of our Western cult of authenticity"[4].

From the conservator's perspective, documentation takes on a critical role. In those cases where art relies on bespoke, deteriorating materials, externally managed and originating services or a critical mass of community involvement there may be no way to ensure its availability. Nevertheless, the maintenance of appropriate documentation can assist conservation and preservation strategies, most notably offering opportunities to characterise value and priorities for individual examples. This can then inform the selection of subsequent conservation or restoration strategies, and ensure their consistency with the spirit of the piece. Gaby Wijers, the Dutch conservator of The Netherlands Media Art Institute, describes the perspective of the 'variable media approach', which argues that "the best way to preserve artworks in ephemeral formats, from stick spirals to video installations to Web sites, is to encourage artists to describe them in a medium-independent way, so as to help translate them into new forms once their current medium becomes obsolete.[67]"

This report is a step towards the development of vocabularies and information structures for adequately characterising all those aspects of contemporary (primarily digital) art that contribute to its value, and that must be in some way kept in order to ensure that its sensory, emotional, mental and spiritual resonance remain. The report primarily focuses on works that are at least partially digital, but encompasses coverage of common issues shared by contemporary art more generally. Facets of interactivity, modularity and temporality present some critical questions that the preservation community must acknowledge; the intention is to highlight risks and approaches that may be applicable to a wider, more generic range of materials. By aiming to solve some of the more difficult issues of digital persistence, we hope to highlight future research directions that might be pursued in order to accommodate the increasingly complex digital infrastructures of tomorrow.

2. Approaching a Vocabulary for Context Classification

It takes careful consideration to effectively determine the meaning of context. In general terms, context defines the discourse, facts, circumstances, environment, background or settings that surround a phenomenon and help to determine, specify or clarify its interpretation. From an empirical analysis point-of-view, this reflection on context is rather vague to allow us to deploy any classification scheme for contextual characterisation of new media art. If the computability – as in *digital*[1], *computer-based* – and interactivity characteristics of new media art [43] are considered as dimensions in the context equation, a parallel can be drawn to sociotechnical theories that define a context for computer-based technologies. Viewing new media art as a sociotechnical system – where the development of artwork binds people, processes and technology in a joint and collaborative effort – could lead to a (re-)appraisal of our understanding of context. Kling [35] situates the baseline for understanding the *social* aspect of context in three elements: (1) *social relations between actors* that influence the adoption, development or use of the technologies; (2) supporting *infrastructure*; and (3) *historical evidence* of actions taken to develop, operate and showcase related technologies. In mapping these interconnected areas to new media art, the related literature suggests a pattern congruent with this methodology. It would be therefore expedient to review this literature, before examining how Kling's sociotechnical approach can be applied to a context classification vocabulary for new media art.

The *Inside Installations* project, an effort focusing on conservation of installation art, has identified the contribution of social interaction between actors (artists, preservation experts, curators and end-users) within the broader interdisciplinary framework of new media art preservation, in the 'observation / participation / communication' triptych [29]. New media art – in its interactive, time-based sense – requires the creation of platforms of exchange that are manifest through technological devices and aim to stimulate a two-way interplay between an individual (or indeed a group of individuals) and a given artwork [48]. This interaction is expressed by Weight [65] as a *trilogical* relationship formed when technology is used to mediate creative communication, its constituents being the human programmer/artist, the executing apparatus, and the human interpreter. However, Weight's concept marginally touches on the blurring distinction between user roles, which often resembles Allan Kaprow's notion of a 'happening' [34] where the artistic motivation lies in "increasing the 'responsibility' of the observer and finally eliminating the audience altogether as each individual present [becomes] part of the event organised by an artist" [12]. From the preservation standpoint, contextual classification needs to move beyond the artwork developer/end-user level, by allowing for the representation of relations of such roles as new media art curators, conservators, commissioners and collectors [43]. However, actors and their relations should be studied within the setting(s) where people and the new media art apparatus meet. These apparatus encapsulate not only any programmed or programmable machine, either networked or stand-alone [65] employed by the artwork, but also the plethora of additional parts (such as frames, stands etc.) used to deliver the intended (or at times unintended) experience of the work. The entirety of these parts constitutes the 'supporting infrastructure' element in Kling's definition of context.

But if new media artefacts are in themselves complex agglomerations of virtual and physical characteristics, which are further depending on environmental – spatial and temporal – factors, what *state* of infrastructural context should a classification scheme reflect? If we accept the parallelism of redefining new media as tendencies in modern art and computing, technologies are not only the enabling factor to materialise the artistic imagination; they are a medium that extends the original idea of a project and as a result have become artworks in their own right [40]. In this sense, the intrinsic characteristics of computer-based technologies – evident in their application within or outside an art template – form the core for providing contextual characterisation. Unfortunately this strategy by itself does not work well. The variety of artistic approaches and the boundaries between what is *art* and what is *technology* blur too much to make terms like 'dynamic', 'interactive', 'collaborative', 'networked', or 'customisable' define precise characterisation of context. What is missing here is the logic behind the sequence of events orchestrating a new media artefact, which directs what is communicated to the audience, when and why. As Paul [45] explains, "[w]hile every art project is embedded in its own specific context, the shift towards a

1 Given the ambiguity of the term 'digital', it is used here to describe artworks where the computer has been used as "a primary tool, medium and/or creative partner" [63].

dependency on context increases with new media works that require information about which data (in the broadest sense) is being shown, where it is coming from, and according to which logic it is configured." Paul pinpoints two additional issues that must be included in the identification of infrastructural context; the first is an account of the different manifestations that new media art works can have and speaks to the medium's variability and modularity. Indeed, the same work can potentially be instantiated as part of an online exhibition, as an installation or a projection within a physical space, or form part of digital archival material. The second issue is the definition of the physical environment as dictated by the specification of artwork requirements in terms of physical and virtual space. In this sense, *context* should describe how the connection – if any – is established between the physical and the virtual. The introduction of manifestations and physical environment in the classification scheme can be based on the experience and assumptions of the preservation/documentation professionals about the ways in which a work could be presented; or draw on historical evidence collected from existing experience with presentation/ instantiation/ documentation of a set of related works.

In Kling's definition of social context for computer-based technologies, this historical evidence describes three distinct entities: development, operation, and showcase of technologies. A number of publications exist that offer a historical roadmap to the emergence and evolution of new media art [6, 9, 53, 64]. Other scholars have focused on historical facts about presentation and curation of new media art in the museum/gallery context [8, 22, 43, 44, 45, 51]]. Candy & Edmonds [8] and Greene [22] provide a comprehensive overview of the history of the field, which shows that the use of digital technology for artistic creation is not a new phenomenon and in fact dates back to the 1960s. What we understand today as new media art is the combination of traditional cultural conventions – which stem from human experience and visual reality, and new conventions of data representation – which are numerical, computational data [40]. From this perspective, the points of convergence between historical cultural forces and digital data use through Human Computer Interaction (HCI) can inform the definition of contextual elements for new media art works. Consider for instance Mark Napier's *Feed*[2], a net art piece that appropriates raw material on the Web not with a goal to provide information, but instead "[consume] information, reducing structure, meaning and content to a stream of text and pixels"[3]. This type of work challenges, indeed redefines, cultural conventions and implicit assumptions regarding conventional perception of technologies whose every-day use has become ubiquitous in our (developed world) society. The aesthetics of new media art, which assume the existence of historically particular characteristics of artistic and cultural production [40], point toward a shift of focus from the digital and technical to the visual and stylistic aspects of digital artworks. In order to promote how human-computer interaction can be understood as an aesthetic discipline, Bertelsen & Pold [5] have introduced the *Interface Criticism Guide*. The guide draws on media and digital aesthetics theory to discern operational perspectives that can be used for the study of visual aesthetics of new media art, so as to address the definition of a vocabulary for *cultural context* that takes into account "the dynamics of interaction in new and relevant ways" [5]. These perspectives are reviewed in more detail later in this study.

A question that arises from the previous analysis is how these different expressions of context can be situated within an operational definition of a vocabulary for contextual classification. Kling [35] suggests the use of *situations* as a methodology to encapsulate different context facets in a scheme that is dependent on: (1) the number of participants (individuals or larger collectivities) that engage with a computer-based technology; (2) the set of artefacts involved; (3) the spatial scale and arrangements of activity; (4) the time periods of activity; and (5) the primary social processes that shape critical behaviour. Using a *situation* as the primary unit of analysis is suitable for defining a context classification vocabulary, particularly because it allows for scalability within and among these five dimensions. Mapping again to new media art, specific situations can be located along, for instance, the first two dimensions based on the number of users that can view/interact with a piece simultaneously. Other situations may be located by the amount of space their equipment occupies and/or the amount of space the participants take up when engaging with the artefact. Time periods of activity can describe the amount of time over which key events of the artwork take place, the total duration of possible interaction between user and artwork, or other temporal components – such as scheduled tasks programmed in a software art work. Social processes can describe critical relationships between 'participants' – and by this we refer to all kinds of and stimuli for cooperation or conflict between actors involved in the creation/presentation/preservation of a

2 http://feed.projects.sfmoma.org/

3 Source: http://feed.projects.sfmoma.org/about.html#about

work; social processes also include beliefs, critiques, resources, common practices, procedural elements and constraints associated with new media art works. In addition to this scalability advantage, situations are open-ended in the sense that the abovementioned dimensions and their characteristics are extensible and flexible enough to permit augmentations and tailoring to particular needs. Table 1 [adapted from 35] summarises these situational dimensions and some of their characteristics that can be used as a starting point for building a vocabulary for context classification for new media art works. The next few sections provide more in-depth information about each characteristic alongside with examples from real world environments.

Starting with population scale, the most basic contextual element involves the transient encounter between an individual and an art work. For instance, Antonio Mutandas' *This Is Not an Advertisement* (1985) was an animated sequence of words created for the Spectacolor Electronic Billboard in Times Square, New York; as it momentarily subverted the public space – its position manifest in the urban context [1] – the interaction between vehicles and passers-by with the work was equally brief. A larger scale of the population dimension is that of an individual assuming a role within the greater new media art environment; an artist, a museum curator, a preservation officer, a collector, an art historian or an artwork observer are all roles that affect to varying extents the meaning of context. Although not new media art-specific by nature, the type of participation of these roles in a *situation* is influenced by the more new media art-specific characteristics of other dimensions. Moving from the individual to the more collective entities, the population scale ranges from an institutional subunit – e.g. the curators of a museum – or an entire institution, to a community – such as a community of contemporary artists in London or a partnership of institutions for knowledge exchange on new media art preservation.

Dimension	**Characteristics**		
Population Scale	Encounter Role Institutional Subunit Institution Community Social World		
Equipment (Infrastructural Context)	Simple	↔	Complex
	Obsolete	↔	State-of-the-art
	Disconnected	↔	Closely-coupled
	Single owner	↔	Multiple owners
	Open source	↔	Proprietary
	Manifestations:		
	Monolithic	↔	Modular
	Invariant	↔	Variable
Spatial	Local	↔	Global
	Compact	↔	Geographically dispersed (distributed)
	Environment:		
	Physical	↔	Virtual
Temporal	Time Scale:		
	Picoseconds	↔	Centuries
	Scheduled	↔	Random
	Perishable	↔	Time persistent
Aesthetics (Cultural / Historical Context)	Stylistic References Materiality Remediation Genre Hybridity Representations		
Social Processes (Behavioural	Critical Relationships:		

Cooperation	↔	Conflicts
Direct	↔	Mediated
Beliefs & Critiques:		
Isolated	↔	Wide-spread
Common Practices:		
Standardised	↔	Ad-hoc
Procedures:		
Community-adopted	↔	Institution-specific
Constraints:		
Political		
Legal		
Physical		
Cultural		
Financial		

Table 1: Situational Dimensions Related to New Media Art

At the highest end of this dimension is the social world, which describes the entire set of entities that constitute the social environment where new media art is created, disseminated, presented and preserved. It is always important to distinguish population scales as they inevitably influence the remaining contextual elements of a work, particularly in terms of social processes that bind together a behaviour setting that surrounds new media art objects and the relationships of the group(s) that populate this setting. Social processes are discussed in more detail toward the end of this study, exactly because they derive from and shape participants' actions with relation to infrastructural, temporal, spatial and cultural characteristics [35]. We will delve into the latter dimensions and develop some examples in the next few paragraphs.

As mentioned earlier, the equipment and infrastructure necessary to create, present and interact with new media artwork are key elements in defining situations. Our interest here is not to provide technical metadata – this is the task of documentation. Instead, infrastructural characteristics for a given artwork refer to the associated resources that are needed to realise or perform a work and achieve the original artistic intentions. Although these characteristics can potentially be static, they are unlikely to stay without changes for a long time because new media art is still evolving [40]. To represent this in the vocabulary, pairs of related characteristics are presented in Table 1 as two ends of a continuum on which specific situations can be placed; as a work evolves, its position on each continuum can change respectively. Hence, the supporting infrastructure for an artefact can range from:

- **Simple to Complex**. The positioning of a work on this continuum depends on such requirements as staff, supporting documentation, equipment contracts, programming skills or working hardware/software. For instance, a multi-part installation that requires assembly of physical parts and configuration of computer-based parts calls for skilled staff and equipment to install the piece, accurate and complete construction documentation and the provision of related software and hardware to render the coded components. In contrast, a framed print of a digital imaging work has simpler requirements for supporting infrastructure. The complexity of infrastructure can also be an indicator of the population layers that are involved in the management processes related to an artwork. Generally, a work is considered more complicated when the requirements for its support cut across many institutional subunits or many institutions [35].

- **Obsolete to State-of-the-art**. This continuum represents the potential of digital artworks with dated or obsolescent components to be migrated or emulated to contemporary mediums, and its converse – i.e. the efficiency and suitability of modern infrastructure for supporting the requirements of obsolete equipment through migration/emulation or other digital preservation techniques. An example of defining this situational characteristic is the

Seeing Double exhibition (2004) which featured "a series of original art installations paired with their emulated versions"[4].

- **Disconnected to Closely-coupled**. This pair of characteristics refers mainly to the relationship of a new media art work with networked environments. At this level, the requirements for equipment – and interrelated entities that ensure the proper handling and operation of the equipment, as described earlier – can vary significantly. In their effort to push the boundaries of technologies, artists can employ systems and computer infrastructure of high sophistication. This continuum is wide enough to encompass all types of technical dependence on networks: from disconnected, stand-alone artefacts – such as prints of digital imaging, to 'artworks-as-information-systems' characterized by large numbers of processing elements interconnected by some scalable high performance network [54].

- **Single to Multiple Owners**. The issue of ownership is addressed here from a supporting infrastructure perspective, rather than from an intellectual property perspective for the artwork itself, which in the United Kingdom is regulated by the Copyright, Designs and Patents Act 1988 (CPDA)[5]. Single ownership is perceived as a case where all the associated resources needed to experience a work ensue from a single role, institution or community. An art installation commissioned, managed and curated exclusively by one museum is such a case. On the other hand, multiple ownership of resources refers to cases where the infrastructural prerequisites to realise a work come from different sources. For instance, the supporting infrastructure for net art works stems from multiple owners: one might be the provider of storage space on a server for the Web pages; another is the Internet Service Provider (ISP) company that offers access to the Internet so that people can view the work; a third might be a private company commissioned to maintain the web site of the hosting institution where the net art work resides.

- **Open Source to Proprietary**. The creation of computer-based artwork inevitably requires the use of equipment (software and hardware) that can be anything between open source and therefore free to use (albeit with exceptions), protected by intellectual property rights, or a combination of both. From this standpoint, the nature of the equipment influences the interpretation of the supporting infrastructure. A digital work administered in the native format of software such as Adobe Flash or Smith Micro Software Poser can only be rendered by use of these applications and therefore requires the obtainment of a license from the parent company; proprietary software is licensed under limitations, which further forbid processes such as reverse-engineering for preservation purposes.

- **Monolithic to Modular**. With respect to the Manifestations concept explained earlier, a work is perceived as monolithic when it is made up and fabricated as a single, one piece, integral structure. More importantly, this structure is unchanging and therefore only allows for one manifestation. Le Corbusier's *Poême électronique* (1958) is such an example. The work consisted of black and white video, colour light ambiances, music moving over sound routes, visual special effects and was created specifically to be installed within the Philips Pavilion building; it has never been reprised after the end of the exhibition [39]. On the other hand, a modular work is composed of units or sections that can be reconstructed or permit flexible (re)arrangement. The work of team *Soul Condenser* for the 3rd Workshop of the Design Department at Domus Academy (2007) is a modular installation that uses water and therefore the walls are made of different materials that are re-adapted according to the environment that the work is exhibited (for instance, ice would be used in cold weather, transparent thermoformed plastic filled with water for indoors exhibition and water fountains for warm climates)[6].
- **Invariant to Variable**. Following the tradition of and analogy to information systems, new media art that uses computerised resources can take inputs and/or produce outputs whose values are liable to change while the work is being experienced by an audience. Within this definition of context, the position of such works tips toward the variable end of the

4 Source: http://variablemedia.net/e/seeingdouble/

5 Source: http://www.statutelaw.gov.uk/legResults.aspx?LegType=All+Legislation&searchEnacted=0&extentMatchOnly=0&confersPower=0&blanketAmendment=0&sortAlpha=0&PageNumber=0&NavFrom=0&activeTextDocId=2250249 (Accessed 10 June 2009)

6 Source: http://www.mararibone.com/index.swf

continuum. The distinction between invariant and variable artworks addresses the issue of capturing the logic behind the artistic piece which dynamically processes inputs and generates related outputs (as explained in page 2 of this study). The common denominator of variable works is that a singular experience – i.e. the way that one specific user interacts with the work and the outputs produced by this interaction – cannot be duplicated. Examples include Ken Feingold's *Sinking Feeling* (2001)[7] and Stelarc's *Prosthetic Head* (2003)[8], where the artworks respond to human feedback and engage in a dialogue with the observer that depends on the inputs provided. Similarly, Leeson's *Synthia Stock Ticker* (2003) and Joshua Portway and Lise Autogena's *Black Shoals Stock Market Planetarium* (2004) produce varying results and representations of data coming from stock market figures reported on the Web. the On the other hand, invariant works are characterised by either unchanging outputs – as in a video recording – or pre-configured logic; the outputs in this case can be duplicated if the input provided by any user is the same. An example of the latter is Barbara Bloom's *Half Full-Half Empty* (2008)[9] where the viewer can choose between events in the past, present and future but the resulting scene is always the same.

Equipment and infrastructural context are closely related to the spatial dimension of a situation, because they are manifest through some kind of physical existence. However, in new media art *space* can take the form of a virtual environment as well – and this is particularly true for Virtual Reality, immersive projects. The characterisation of the spatial setting of new media art works is the result of a process that is based on evidence and objectives that derive from the overall framework surrounding a work's commission, acquisition, exhibition, presentation or preservation strategies. These strategies reflect the decision-making mechanisms for identifying priorities, programmes, policies and space allocations alongside with the resources necessary to deliver them. Such decisions may include:

- The confirmation that the space occupied by a work is available at the right time and in the right place and that it accords with the requirements for social and physical infrastructure.

- The accordance of costs incurred by the use of a space with institutional policies and availability of funds. In cases where a work is installed in a public space[10], the understanding of policies extends beyond monetary terms and requires cooperation from public services and authorities.

- The contribution to local distinctiveness and community-specific objectives, which – from an institutional viewpoint – justify the investment in a work and promote economic, environmental and social benefits for a community.

Building on the above, the characteristics of the spatial dimension can be mapped to new media art as follows:

- **Local to Global**. The spatial dimension is characterised as *local* when the incentives to deal with or create an artwork (depending on whether the issue is perceived by an institution's or an artist's side respectively) serve the concerns of a local community. The aim is to generate "critical socio-cultural context, as well as [promote] public critical discourse and new forms of creative collaboration in the local community" [57]. Based on the nature of the environment where the work is situated, these communities can belong to both a physical and a virtual sphere. Examples of local spatial context include work undertaken by the Community Art Lab at the Vrede van Utrecht Foundation in the Netherlands[11], events like the *Fertile Ground* exhibition[12] and the creations of such artists as Judy Baca[13] and Suzanne Lacy[14]. At the other end of the continuum, the spatial dimension is characterised as *global* when the outreach of an artwork is universal and not confined by any kind of boundaries.

7 http://www.kenfeingold.com/catalog_html/sinking.html
8 http://www.stelarc.va.com.au/prosthetichead/
9 http://www.diacenter.org/bloom/
10 For instance, see Kit Galloway and Sherrie Rabinowitz's *Hole-In-Space* (1980) installed at the Lincoln Center for the Performing Arts in New York City, and "The Broadway" department store located in the open air Shopping Center in Century City, LA. (Source: http://www.ecafe.com/getty/HIS/)
11 http://vredevanutrecht.com/community-art/2008/08/22/community-art-lab-research-2008-2011/
12 http://rhizome.org/editorial/fp/reblog.php/1756
13 http://www.judybaca.com/now/index.php
14 http://en.wikipedia.org/wiki/Suzanne_Lacy

- **Compact to Geographically dispersed.** The operational requirements of a work influence not only the amount of space that the artefact occupies, but also the amount of space and spatial arrangement necessary for observers to experience it. Hence, a *compact* artwork is understood as one that is arranged within a single space that can further be relatively small compared to the entire environment within which it is situated. In contrast, a *geographically dispersed* work is comparable to a distributed system architecture, with the artistic experience being provided by components scattered in different locations that collaboratively run tasks in a transparent and coherent manner. Examples include *Hole-in-Space*[15] and Jeffrey Shaw's *The Distributed Legible City* (1998)[16].

Similarly, we can discern temporal characteristics of new media art that describe a situational dimension related to time periods of activity. These include:

- **Timescale: Picoseconds to Centuries**. Although *time* has been a recurring theme and notion throughout the history of the Arts in general, the arrival of computerised means to create art has revolutionarised the way that artists can exploit temporal qualities to produce highly time-based artworks. The limits of the Timescale continuum represent two extremes, which are nonetheless potentially achievable and definitely evident in new media art works. For instance, Sadie Benning's *Play Pause* (2006)[17] video installation displays a narrative through gouache illustrations, with each image appearing only for a couple of seconds[18]. At the other end of the continuum, John F. Simon Jr.'s *Every Icon* (1996) needs approximately six billion years to reach the end of the second row of a 32x32 square grid [63].

- **Scheduled to Random.** This continuum refers to the time sequence of events unfolding as part of a new media art work. While in *scheduled* works this sequence is pre-defined and hence the experience received from the piece by different users is theoretically the same, artefacts characterised by randomness in the temporal dimension expose their events in no specific fashion or in a non-linear manner. The latter differ from *variable* artworks (cf. p. 7 above), because they do not necessitate some kind of user input to produce a result (in which case the event is not random, it is 'user-driven'). An example of a scheduled work is Janet Cardiff & George Bures Miller's *The Telephone Call* (2001)[19], a video walk that leads visitors through the museum on a meandering tour up the central staircase, taking them briefly into a nearby gallery, and then into a service stair normally off limits to visitors; the path that the walk follows is pre-defined[20]. On the other hand, in Nam June Paik's *Participation TV II* (1969), signals sent from video cameras to television sets were manipulated randomly by acoustic signals, and the result was that viewers could see images of themselves distorted in random ways, interacting with the abstract forms and patterns on the screen [18].

- **Perishable to Time-persistent**. The advent of new media art – and contemporary art in general – has marked a new era in the materials that artists use to bring their creativity to life. This pair of characteristics addresses the emergence of works that may be (intentionally or otherwise) short-lived due to their construction through *perishable* materials, as opposed to works whose deterioration, ageing and wear is at a par with traditional art forms and thus considered more *persistent* to the passing of time. Within a context classification scheme, this issue is of particular importance as institutions and collectors have been struggling to preserve and insure perishable new media art pieces [3, 41]. Examples are numerous: from Sarah Lucas's *Two Fried Eggs And Kebab* (1992) and *Au Naturel* (1994)[21] to Damien Hirst's *Love Lost* (1999)[22] and Dan Peterman's *Store (Cheese)* (1991-93) [13].

As mentioned earlier in this study, Aesthetics can provide a solid representation of the cultural and historical context that spans a work's lifetime. The original situational dimensions for computer-based technologies defined by Kling [35] do not include a cultural dimension as such – although glimpses and traces of it can be witnessed among the characteristics of the remaining dimensions.

15 *Id. Supra* note 10
16 Source: http://www.jeffrey-shaw.net/html_main/show_work.php3?record_id=102
17 http://whitney.org/www/exhibition/benning.jsp
18 Source: http://rhizome.org/editorial/2642
19 http://www.sfmoma.org/multimedia/audio/aop_tour_421
20 Source: http://www.cardiffmiller.com/artworks/walks/telephonecall.html
21 Source: http://www.bbc.co.uk/dna/collective/A6641318
22 http://www.artnet.com/artwork/58443/414/damien-hirst-love-lost.html

Here we are using the theory and guide developed by Bertelsen & Pold [5] to provide an initial vocabulary for cultural context, which is based on six operational concepts[23], that are summarised in the following few paragraphs. The first concept in the guide refers to the analysis of *stylistic references*, whose source can be found in three areas. One is inheritance from predecessors and normative guidelines in the HCI field. For instance, Char Davies' work Ephémère (1998) is an interactive fully-immersive visual/aural virtual artwork which furthers the work begun in an earlier project called *Osmose* (1995)[24]. Jeffrey Shaw's The Distributed Legible City (1998) is a new version of his 1989 project, which extends the original's aesthetics with multi-user functionality[25]. Similarly, human interface guidelines proposed by Apple[26], Microsoft[27] or Nokia[28] influence the aesthetics of software and create a coherent look-and-feel among – otherwise dissimilar – applications[29]. Stylistic references can also be found in art and architectural history; The aforementioned Bertelsen & Pold suggest a number of ways that interface style can be characterised as baroque, renaissance or romanticist. Lastly, stylistic references can be expressed through 'fashions' in application design. In the new media art paradigm, such cases include Avatars created for virtual worlds [37] and artistic customisations for application software – such as skins and wallpapers for mobile phones, and themes for operating systems' graphical user interfaces[30].

The next concept seeks to identify the materiality and remediation of the interface through which the audience experiences and communicates with a digital artwork. *Materiality* is used here to describe the constituents of a digital work's interface, such as code, algorithms and pixels. In new media art, there are examples of deconstructive interfaces which expose their own construction or that of other resources. Perhaps the best specimen of this type of work is the art of Joan Heemskerk and Dirk Paesmans – a collaboration established under the title *jodi*[31]. Jodi's net art is famous for "[stripping] away the reassuring navigation bars and identifiable pictograms of the everyday Web site to let loose the HTML behind the façade" [32]. *Remediation* on the other hand, a new media theory by Bolter and Grusin [7], proposes the logic of remixing older media forms by newer ones and vice versa; the theory sheds light on the interdependency of all media and highlights the ways that reality itself is mediated by and for social actors[32]. New media art is often the product of mixing together text, video, audio, machinery and digital technology. Game art offers a good example of remediation and its many facets, with such works as Mike Beradino's *Atari Painting* (2008)[33], Alexander Galloway's *How to Play the World of Warcraft* (2005)[34] and Michael Bell-Smith's *While We Slept* (2004)[35], which appropriate vintage video games to create a remediation of the original with a new scope. The converses of these works are the creations of artist and sign maker Melissa Jones who creates original wood carvings of classic arcade characters[36].

Another concept in the Interface Criticism Guide is that of *Genres*. The issue has been explored in a number of publications [38, 55, 59, 63]. Although there is no agreed standard genre vocabulary, the linchpin of the scholarly approaches is the understanding that a classification of genre builds on traditional art practice and can only be temporary – based at each time period on the contemporary state-of-the-art technology and evolving / being redefined as new technologies emerge and "become more refined and familiar" [63]. At the same time, genres can further "define roles for the

23 *Vide supra*,
24 Source: http://www.immersence.com/ephemere/index.php
25 *Id. Supra* note 16
26 Source: http://developer.apple.com/documentation/UserExperience/Conceptual/AppleHIGuidelines/XHIGIntro/XHIGIntro.html
27 Source: http://msdn.microsoft.com/en-us/library/aa511258.aspx
28 Source: http://www.forum.nokia.com/Tools_Docs_and_Code/Documentation/Usability/UI_Style_and_Visual_Guidelines.xhtml
29 For instance, see Liliana Porter's *Rehearsal*, Barabara Bloom's *Half Full – Half Empty* and Dorothy Cross's *Foxglove* (all in Dia's Web Projects page: http://www.diabeacon.org/webproj/). The three artworks share similar features in their interface that are inherited from the common use of Adobe Flash. These features are distinct from, say, Napier's *Net Flag* (http://netflag.guggenheim.org/netflag/) interface – developed in Java and presented online as a Java applet.
30 For instance, see the DeviantArt customisation page: http://browse.deviantart.com/customization/?order=24
31 http://www.jodi.org
32 Source: http://en.wikipedia.org/wiki/Mediation_(Marxist_theory_and_media_studies)#Remediation
33 http://mikeberadino.com
34 http://www.arthousetexas.org/index.php?_page=load_page&_id=RPGalloway
35 http://www.foxyproduction.com/artist/workview/5/167
36 Source: http://technabob.com/blog/2008/03/15/awesome-arcade-game-art-by-melissa-jones/

user and his interaction" [5] with new media artefacts that varies between, say, an interactive installation and a digital imaging piece. The concept of *Hybridity* becomes then influential, as it exposes the agglomeration of functional and cultural interfaces that surround new media art. Consider for instance *Crank the Web* (2001) by Jonah Brucker-Cohen, a browser that allows people to physically crank their bandwidth in order to see a website. The idea behind Crank the Web is to combine ancient forms of automation with today's digital telecommunications technology, thus creating a hybrid between mechanics and digital technology[37].

The abovementioned concepts of stylistic references, materiality and remediation, genre and hybridity reflect features of aesthetic theory and how these contribute to our understanding of a cultural context shaped by historical evidence. Bertelsen & Pold [5] hold that these features contribute towards an awareness of issues and related analysis methods pertaining to *representations* of new media. Based on this logic, they distinguish two types of representations: realistic or naturalistic versus symbolic and allegorical. Evidently this idea is not new; representation in the Arts has been the subject of many philosophical debates from Plato and Aristotle to Duchamp, McLuhan, Adorno and Dutton. Although an *in extenso* analysis of representation in the Arts is beyond the scope of this study, it should be noted that new media art challenges some of the traditionally accepted aesthetic principles. For instance, Dutton [20] has expressed seven signatures in human aesthetics that include virtuosity, non-utilitarian pleasure, recognisable styles, criticism, imitation, special focus set aside from ordinary life and imagination. However, many new media art works are essentially exceptions to these signatures. Take Jodi's net art for example[38] where virtuosity of web technology is deliberately avoided; or Cohen's *Crank The Web* (*Ibid.*) that contradicts non-utilitarian pleasure. These characteristics of the cultural dimension in identifying a *situation* – and therefore classify contextual elements - might not be immediately observable and possibly difficult to represent and use as part of a vocabulary, but they do influence the nature of the other dimensions and should therefore be taken into account.

Having explained the meaning of population scale, equipment, spatial / temporal and cultural context, we are faced with a question: how do these dimensions and their related characteristics fit into a grander scheme of things, which initiates, motivates or discourages and dissuades certain behaviours in the participant ecology? Social processes are perceived here as a means to work towards addressing this issue of *behavioural context*. Kling [35] offers that the way participants in a situation conceptualise their actions, adopt practices and procedures, form coalitions and deal with constraints is influenced and dictated by another situation that is larger on at least one of the other dimensions. The boundaries of this *defining situation* used to interpret the *focal situation* are defined by criteria that regulate how limited or encompassing the boundaries will be. Building on these views, the characteristics of social processes are summarised in Table 1; again, these characteristics do not apply uniquely to new media art but are rather evident in any development, interaction and usage of computer-based technologies and humans. Mapping social elements to new media art is by definition prone to exclude certain elements or lack depth, simply because these processes are complex and often very specific to particular contexts. Notwithstanding the potential of a shortcoming, we will attempt to at least explain how these elements could be interpreted within the context classification vocabulary.

Critical relationships between participants are essential for understanding the environment surrounding the creation, commission etc. of new media art. To this end, two continuums are suggested. The first ranges from *cooperation* between participants/populations scales to *conflicts*; it represents agreements, debates, joint actions, oppositions or controversy surrounding either individual pieces or new media art in general. An example that has become ubiquitous in modern discourse is the ongoing debate in the institutional art world on whether new media art constitutes a distinct field, whether it should be considered 'just art' or even whether it is art after all [19]. On the other hand, Community Art (as explained earlier in the spatial dimension local characteristic) is a case where the social environment promotes or at least strives for cooperation between participants. At an institutional level, cooperation and conflicts represent the relationships between roles / subunits within the institution or among institutions. The second continuum describes the nature of these relationships, based on the distinction between *direct* and *mediated* contact. For instance, a common occurrence in modern museum practices is for a curator to closely collaborate with a new media artist, often exchanging ideas and helping each other understand their role in the lifespan of the work. In other cases, communication between artist and audience is mediated by

37 Source: http://www.coin-operated.com/projects/cranktheweb.html

38 *Id. Supra* note 31

some third party. Such cases include online art galleries that provide artists with a platform to promote their work to potential buyers/collectors without the necessity of interpersonal contact.

Beliefs and critiques describe the discussion or evaluation of new media art and can range from *isolated* – as in the body within the arts community engaging to art criticism – or *widespread*, which can extend as far as encompassing the social world. The breadth of this characteristic depends on the level of population scale under which a particular instance of the classification scheme is viewed. Similarly, procedural elements can be studied anywhere between institutional and community levels. These procedures may describe the manner that a work is acquired and installed within an institution's physical space, management decisions over funding for an art commission, assessment procedures in order to evaluate the impact of a work on the target audience, surveillance procedures to ensure the security of an exhibit, or conservational methods. Akin to procedures are the characteristics of a situation that refer to common practices in dealing with new media art and can range from standardised to ad-hoc. From an institutional standpoint, these may include the process and policies adopted for documentation and preservation. From an artistic point-of-view, these practices describe situations where the methodology of the artist has a direct effect on some aspect of social life (for instance, hacking-as-art of everyday tools, communication platforms etc[39]).

Lastly, constraints is a rather abstract term to position the role and consequences of limitations and restrictions placed on all the aforementioned dimensions, and can stem from a variety of sources. Constraints are possibly one of the most difficult facets of context to include in a vocabulary, particularly if the suggested terminology needs to provide rigorous and thorough classification. In this sense, it would be unrealistic to provide an inclusive account of examples; constraints are very 'situation-specific' and can therefore vary between cases, so much so that what constitutes a limitation in a particular context might be negligible in another. A reasonable – and definitely more thorough – account of potential constraints with new media art is given in [42].

As a final comment, it should be understood that the reviewed dimensions and their characteristics are not orthogonal. Many are mutually dependent are require combined consideration in order to fully describe the contextual background of a work. This study provides a first step towards reaching the objective of a vocabulary for context classification by use of sociotechnical theories. The approach needs to be empirically validated so as to gauge its suitability and understand its potential impact on situating the much sought after but thus far eluding 'pinning down' of new media art context.

39 Source: http://www.neural.it/art/2008/02/plink_jet_plucking_inkjet_prin.phtml

3. Documentation of Intrinsic Aspects of Contemporary Art

3.1 Introduction

Given the often ephemeral, unstable nature of art, and particularly contemporary and/or new media art, documentation assumes considerable importance within the conservation domain. Olivia Polioni describes the evolution of the conservator's priorities, which were traditionally focused on the maintenance of a work in its original form. "Now their job largely incorporates the physicality of the documentation that accompanies the contemporary work of art which can hold the utmost importance over the object; so the idea stays alive for generations to come, and perhaps not the physical object" [47]. The extent to which some aspects of contemporary art can actually be 'preserved' in their original (or a suitable surrogate) form remains unclear. Current methods appear to lack the capacity to maintain facets of artistic meaning which may be embedded in specific materials, implicit in the nature of audience interactions or incumbent on software or third party dependencies.

Richard Rinehart explains that "these art forms have confounded traditional museological approaches to documentation and preservation because of their ephemeral, documentary, technical and multi-part nature and because of the variability and rapid obsolescence of the media formats often used in such works" [50]. Their volatility, often deliberate (among the most notable of such artistic sub-genres are destruction art and organic art) has natural implications for their availability and permanence.

A wide range of literature has been published on possible means for documenting new media materials, and contemporary art more generally. Motivations have ranged from the facilitation of information discovery to the provision of reference materials that present necessary information to enable the recreation of obsolete creative efforts (in a role analogous to that performed by musical scores). It is appropriate to describe some prominent work in the area prior to the identification of their potential applicability (and perceived shortcomings) within the creative domain and beyond.

3.2 The Conservation of Modern Art Project

Until the late part of the last century few if any established means were available to document and plan for the conservation of contemporary art materials. The boom in the creation of such materials since the 1960s necessitated some kind of provision. The *Conservation of Modern Art Project*, culminating in the symposium and 1999 report and proceedings entitled "*Modern Art: Who Cares*" explored and presented ten case studies that highlight the challenges implicit in contemporary art conservation[40]. Furthermore it offered initial documentation and decision making models aimed at supporting the longer term availability of these works. While no explicitly digital collections are covered in the project's case studies, those which were involved such as kinetics and mixed media arts demonstrated many comparable attributes.

A valuable outcome published within the report is a decision making model for conservation and restoration of modern and contemporary art, which built upon Ernst van de Wetering's model for decision making in art conservation more generally [70]. Each component of the model is fleshed out with relevant check-lists and criteria that must be documented.

The initial stage, of data registration, is among the most important, and forms the primary phase of documentation. Associated descriptions encompass not only the state of the object as it is, but also the steps that led to its creation, and an account of constituent parts. In Planets terms one might regard this phase as analogous to characterisation. Like in the Planets model, conservation, or preservation actions are only legitimised after accumulating such information. Various considerations are documented within this phase, including information from the artist about the object's production, its fundamental meaning or meanings, and most importantly the significance of any component material parts. A critical emphasis throughout the report is the role of the artist in determining significance, value and the appropriateness and completeness of documentation and any subsequent conservation strategy. Communication between artists and other stakeholders within the preservation process is critical; art historians, curators, conservators, and technologists must all be capable of contribution in a structured fashion to the process. The condition of the work is also scrutinised and documented, as it was both now and originally. A condition report is drafted – the model suggests that "composition and ageing of materials be scientifically investigated

[40] See http://www.jgpubs.com/m_art_who_cares.html

followed by analysis of mechanical ageing". Within a more digitally oriented context this might be usefully substituted or made more comprehensive by considering aspects of preservation risk associated with ongoing availability. Likelihood of obsolescence based on physical and semantic factors should be documented. As well as the artist's account of selected materials' value, a description is retained of specific characteristics, brandings or availability of intrinsic material. For a digital work, this might encompass programming languages used, hardware required and file formats of intrinsic assets.

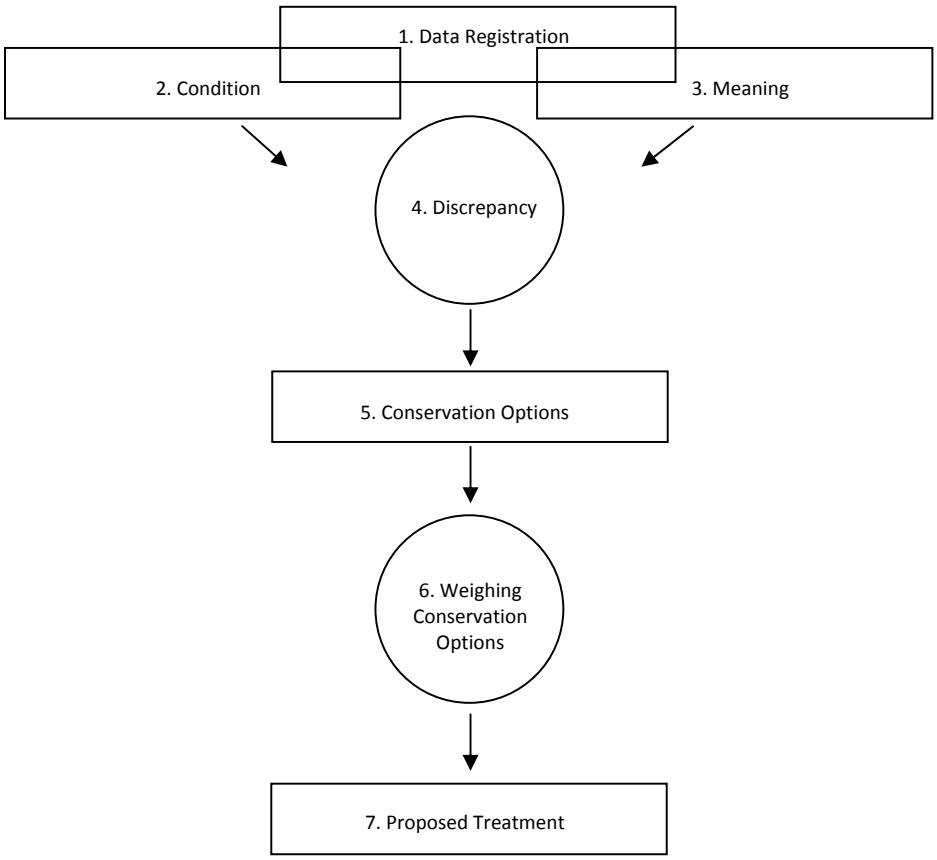

Figure 1: *Conservation of Modern Art Project*'s Decision Making Model

While these phases are consistent with registration for almost any work, the third phase, focused on the determination of meaning, is less typical. For contemporary art, like with many digital materials, the meaning, value or significance is often not self evident. It is the benchmark for evaluating potential conservation options – the most critical question being, 'does this approach preserve the piece's meaning'? Meaning encompasses both contextual and intrinsic qualities associated with the object; the former is well discussed in the previous chapter and may extend to issues of criticism, time, place, or a particular event. More intrinsic issues of meaning may be most obviously established by reference to the artist, and may be embedded in the choice of particular materials, their arrangement, or the manner within which they are consumed or developed, or the nature and extent of audience interaction. The process of determining meaning is difficult, time consuming, and potentially may never really be completed. A curator or conservator may attempt to do so by reference to a range of sources, in the pursuit of answers to a number of questions. The work's subject or theme; the significance of its specific physical, visual or mechanical qualities (its 'perceptible appearance') or of materials or production processes used; and its fundamental means of expression all contribute to interpretation of meaning. Discrepancies are determined, between the work's condition and meaning – does a piece that has physically degraded suffer a corresponding deterioration of meaning? To put this question into a more familiar digital context, one might ask for example whether a net art installation viewed within an upgraded web browser application detracts from its meaning. Numerous factors contribute to this discussion; *Modern Art: Who Cares* suggests that these might include issues of aesthetics, authenticity, historicity, functionality and artist's opinion. A checklist expands on each of these factors, and assists the determination of the extent to which discrepancy exists, although it may also be used to consider the effects of *anticipated* change or deterioration. Like digital preservation, art conservation is

responsive to emerging discrepancies, but also (with *preventative* conservation) pre-emptive to future threats.

With the work's significance determined, and an increased sense established of how its physicality and context affect this meaning, one can proceed. The latter phases of the model focus more on the deployment of appropriate responses to perceived or anticipated discrepancies; conservation options are considered and weighted and treatments proposed. Alternative approaches are considered in terms of the extent to which they will detrimentally affect meaning, in terms of the same factors used to identify and illustrate discrepancy, balanced against factors such as cost, the relative importance of the piece in the artist's ouvre, associated artistic movement or collection, technical limits and possibilities, restoration ethics and any legal considerations.

A means of documentation that facilitates the recreation or reinstallation of lost or obsolete works has been a goal of the contemporary and new media art community for some time. Notable projects such as the *Variable Media Network* have encouraged contemporary and new media artists to accompany their works with media-independent descriptions that facilitate their interpretation and exhibition over time. The *Conservation of Modern Art* project's data registration model is an early form within which such documentation might be packaged, and although it falls short of that goal, has nevertheless proved influential.

Data Registration Model - Conservation of Modern Art Project
Section 1: IDENTIFICATION
1. Name of institution
2. Inventory number
3. Artist's name
4. Complete title
5. Identification (detailing name and position of source of work, if not the artist)
6. Dating
7. Key word(s) for object (e.g., assemblage, installation, environment, relief, sculpture, object, painting)
8. Key word(s) for style or movement (e.g., minimalism, conceptual art, photorealism, zero movement, pop art, realism)
9. Meaning of the art work (indication of the decision making model already completed, or if not, includes artists comments about intention, taken from sources including letters, interviews, notes, texts with notations about use of materials, means of presentation, means of preservation, ideas about restoration and conservation; art-historical interpretations of meaning of the work)
10. Additional comments
Section 2: LOCATION
1. Location of the object
2. Location of materials within which the object was packaged
3. Additional comments
Section 3: DESCRIPTION
1. General description (record aspects such as colour, representation or other factors that are visible but which cannot be described in another field)
2. Illustration/reproduction of the work, with separate sheet 'illustrations' describing referenced images
3. Number of parts, specifying separate parts
4. Completeness
5. Certificated
6. Signature
7. Inscription
8. Legend
9. Label
10. Dimensions
11. Weight
12. Material key word(s) (indicating what material or materials the object is made from): • Specifications (indicate what kinds of materials have been used, with separate 'material data' sheet providing more detail according to categories "materials", "prefabricated parts", "reused objects", "immaterial aspects", "additional original material/spare parts supplied by artist", and "appliances/accessories") • Condition (indication of condition material is in: good, moderate or bad, largely subjective attribution, with exact definition to be determined by museum. Primarily concerned with the condition of the material) • Additional Comments
Section 4: PRODUCTION
1. Location of production

2. Production method/technique: • Production process used in the work (e.g. Artist's hands, commissioned 3rd party, workshop with practical help from assistants, purely conceptual, combination) • Production method (e.g., welded tube frame) • Tools and equipment used (e.g. Arc welder) • Documents relevant to production (e.g. Drawings, photos, videos, pictures) • Persons involved (family, friends, assistants who can be consulted) • Literature • Comments
Section 5: HANDLING AND STORAGE OF THE OBJECT
1. Past treatment
2. Completed model for condition registration
3. Storage conditions (storage, packing materials, climate)
4. Maintenance (what, frequency)
5. Handling (number of people required to move object; what 'instruments' are needed, such as gloves, fork lift truck; where object should be held for lifting and how it should be handled, such as do not lift from cage construction, only handle the wheeled undercarriage)
6. Transportation
7. Exhibition Procedures (whether or not the object may be exhibited, denotes exhibition conditions)
8. Lending (whether it may be lent out, conditions of loan)
9. Additional comments
PRESENTATION / INSTALLATION
1. Particular conditions (any particularities relating to whether special conditions are required for installation of the object.
2. Additional comments
LITERATURE/CORRESPONDENCE
1. Exhibitions, internal/external – title, location, place and date of internal and external exhbitions in which object has been displayed
2. Literature on the art work
3. Correspondence – brief description of the subject and use a specific code or sign to state where the correspondence can be found
4. Additional comments
THE ARTIST
1. Interview with the artist: available/unavailable (does it exist, where is the transcript?)
2. General information about the artist: present/absent. (if no such file exists, collect and note as much information as possible about personal details of the artist, artist's address, names and addresses of artist's associates, extra information about the artist).
ACQUISITION
1. Key words for acquisition (e.g. Purchase, exchange, on loan, gift, conveyance, legacy)
2. Acquired from
3. Date of acquisition
4. Provenance (is there information about the object prior to its arrival in the museum)
5. Purchase price
6. Insurance value
7. Additional comment

Table 2: Registration Model for the Conservation of Modern Art Project

3.3 Variable Media Questionnaire

Developed in 2000 by Guggenheim associate curator John Ippolito within the *Variable Media Network*[41], the Variable *Media Questionnaire* has been described as a tool to facilitate preservation of new media art. It consists of a web accessible form connected to a database that can be used by museums to describe behavioural characteristics of new media, digital, interactive and performative acquisitions. The purpose is twofold, to characterise the accessions and to contribute towards the definition and delivery of appropriate conservation approaches. By making explicit the parts of new media art prone to change over time, or with implicit temporal variable qualities, it aims to equip museum practitioners and artists to collaboratively effect their appropriate evolution. Artists' creativity is exploited during the preservation process – the questionnaire responses describe how the responsible artist wishes their work to be conserved and if necessary recreated into the future.

The questionnaire instrument is structured according to a number of behaviours, used to characterise individual works. These are both distinguished and independent from medium or material specific considerations, and mutually compatible so that individual works may demonstrate

[41] http://www.variablemedia.net/

multiple behaviours. Preservation approaches based on the characteristics of particular media are considered to be as prone to obsolescence as the collections that they are supposed to maintain. Ippolito argues that “as soon as video became obsolete, so would a video-based prescription for re-creating an artwork” [2003]. In addition, the emergence of new types of media would demand constantly evolving description approaches. Hybrid materials that utilise more than one different media would pose further difficulties where characterisation approaches were segregated (and mutually exclusive) across media boundaries. The behavioural classifications make explicit the changeability of individual works, and allude to appropriate classes of conservation approach that might be employed to ensure their persistent availability

Installed: This behaviour described those works that must be changed in some way with every exhibition. The questionnaire prompts for expression of ideal conditions for display, encompassing space and lighting preferences and optimal means for organising or assembling component parts.

Performed: Most questions associated with this behaviour anticipate presentation in a performer/audience environment, but the definition adopted by the Variable Media Network is more widely applicable. Meg Webster’s piece *Stick Spirals* provides an example. Webster requires museum staff to collect fallen branches from the local area for inclusion within the piece, stipulating that they must have been pruned for a purpose other than exhibition. The manner in which the sticks must be assembled (the installation) is made similarly explicit, but this additional performative aspect is, in the artist’s mind, just as critical for the piece’s meaning to persist.

Interactive: This behaviour encompasses those aspects of meaning dependent upon user interaction. For example, Felix Gonzalez-Torres’ *Untitled (Public Opinion)* consists of a pile of (replaceable) “black rod liquorice candy, individually wrapped in cellophane”, which audience members are encouraged to take, and to eat. Meanwhile, artist Jane Clarke unwillingly provoked controversy with her installation *Made in God’s Image*, which encouraged visitors to Glasgow’s Gallery of Modern Art to annotate the pages of a bible with their thoughts and feelings. Interestingly, following the addition of a series of messages considered offensive to Christians and Christianity Clarke requested that the bible be enclosed in a case, with visitor thoughts to instead be written on adjacent sheets of paper. Explaining her instruction, Clarke said that “it was never my intention to offend anyone – believers and non-believers alike. I had hoped that people would show respect for the Bible, for Christianity and indeed for the Gallery of Modern Art. I am saddened that some people have chosen to write offensive messages.”

Reproduced: The questionnaire does not explicitly distinguish analogue and digital materials; instead, its focus is on behavioural differences. Reproduced materials are those that have been copied with a degree of quality loss. Examples include analogue prints and audio and video recordings. Of greatest importance for such materials are the issues associated with the original, such as its ownership, location and status, and of any associated permissions to create further or additional derivatives.

Duplicated: Those materials cloned without loss are said to be duplicated; executable, computer based works like John F. Simon, Jr’s *Every Icon* are the most obviously duplicable, but the behaviour extends beyond the digital to also encompass those works that can be installed in multiple locations simultaneously, like *Stick Spiral* or *Untitled (Public Opinion)*.

Encoded: This classification encapsulates those behaviours associated with computer programming, upon which the work depends. Questions associated with this behaviour relate to run time issues such as look and feel, performance and reliance on external inputs, as well as those more generally associated with software, such as associated license restrictions.

Networked: This behaviour relates to networked applications, those that are in some way distributed across a means of electronic communication such as the Internet. Details of required network peers, protocols in use and bandwidth demands all come under scrutiny within this part of the Variable Media Questionnaire.

Contained: This final behaviour is associated with works that have elements of construction that must at some point be changed. The questionnaire tackles the issue with reference to requirements for cleaning surfaces, or replacing frames or mountings. Even more traditional, perceptibly static works such as sculpture or painting demonstrate a more variable quality when considered in terms of their immediate physical context, which may become almost part of the work.

The table below presents a non exhaustive selection of variables associated with the listed behaviours:

Behaviour	Classifier	Variables
Contained	Glazing	None Other Reflective Non-reflective
	Coating	None Other Matte Glossy
	Support / structure / mounting	None Generic Particular
	Frame	None Other Artist's frame Custom-made Generic / standard
	Acceptable changes in surface	Weathering Colour fading Colour / tonal shifts Patinization Oxidization
Installed	Space	Fine art or museum gallery Large-scale movie theatre Small-scale viewing room Other indoor space Outdoor urban space Outdoor rural space Multiple locations
	Boundary	Defined by physical components Defined by predetermined viewing space Occupies an entire room Can be interpenetrated by other works
	Access	One viewer at a time Number of viewers determined by artist Number of viewers determined by space No limit Viewers cannot enter the space
	Lighting	Normal museum lighting As dark as code allows Natural light Specialized lighting
	Sound	Allow spillover from other works Isolate acoustically from other works Specified volume
	Security	No security required Requires stanchion Requires alarm Requires guard Requires base Requires glazing
	Base	None Standard pedestals One platform for entire work Custom-made
	Distribution of elements	Other Equidistant in vertical format Equidistant in horizontal format Equidistant in grid Juxtaposed Face to face Abutting / touching / contiguous Scale to fill room or wall Random distribution
	Display equipment for inert elements	Other Pedestal Vitrine Plinth Display case Mannequin

	Architectural placement	Other Fixed hanging height Fixed distance from wall Viewers walk round the piece Viewers walk on the piece Combination Directly on the floor Eye level
	Equipment visibility	Conceal all Conceal some Leave visible
Performed	Props	Disposable Unique
	Set	Disposable Unique
	Acceptable submasters or exhibition copy	For exhibition For research For archive For public dissemination
	Permission to create submaster	Not required Required from artist or estate Required from owner of master Not given
	Fate of exhibition copy	Require borrower to destroy Require borrower to return Distribute freely Other
	Permission to compress / digitize	Combination Not given For low-resolution distribution For high-resolution distribution
Duplicated	Inert material	Combination Construct according to blueprint Purchase according to instructions Gathered according to instructions
	Physical attributes of inert material	Specified by artist
	Authorized fabricators and vendors	None Artist Gallery
	Materials duplicated according to	Product brand or maker Blue print Instruction
	Electronic equipment and hardware	None Custom-made Off-the-shelf
	Fate of exhibition copies	Other Require borrower to return Require borrower to destroy Require borrower to disperse
Encoded	Screen resolution	640 x 480 800 x 600 1040 x 768 (sic) Greater than 1040 x 768 Optimum resolution
	Colour palette	8-bit or below / 256 websafe 16-bit / thousands 32-bit / millions (sic)
	External data source	Combination Audio files Video files Fonts
	Fonts	Indexed Web safe Other ASCII

	Source openness	Other Open to every user Open to exhibition venue and its staff Closed
Networked	Can be exhibited	Over live Internet connection As stand-alone copy Broadcast Combination Cached, with Internet connection active
	External data sources	Text from external sites Images from external sites Dynamic database feed
	Minimum bandwidth	14.4kbps or lower 28.8kbps 56kbps 1mbps Other
	Network model	Client / server Server-based (thin-client) Peer-to-peer

Table 3: Variable Media Questionnaire Behaviours and Values

As well as characterising their works according to these behaviours, artists completing the questionnaire are encouraged to consider potential preservation solutions appropriate to minimize threats of loss of meaning. These means of avoiding so-called 'slippage' range from storage of legacy materials that are most under threat (such as digital components or perishable items), to more familiar digital preservation approaches like emulation and migration. A final approach, considered to be the most flexible, but also least immediately 'authentic' is reinterpretation, the act of replacing physical or intangible aspects of a work with contemporaneously available alternatives.

It is acknowledged that demanding specificity in artists' responses is unlikely to yield useful feedback to support preservation. Instead, respondents are encouraged to qualify their answers in terms of a sliding scale of acceptability. A work that requires a fifty-six kilobits per second Internet modem connection may also function adequately with lower or higher bandwidth capacity. Similarly, a work with preservation requirements most obviously satisfied using an emulation strategy might be reinterpretable under certain conditions. Because each art work will be accompanied by responses from potential several respondents, including the artist, his or her assistants, curators and conservators, the resulting information provides a more organic means of planning future preservation than simple, rigid stipulations that might have little real-world feasibility.

3.4 The Variations 2 Project

The Overview section of the *Variations2 Indiana University Digital Music Library Project* describes its aims to "establish a digital music library testbed system containing music in a variety of formats, involving research and development in the areas of system architecture, metadata standards, component-based application architecture, and network services"[42]. In 2003 the project released a data model specification capable of facilitating the description of digital music materials. In doing so it leveraged existing work aimed at the conception of means for encapsulating material description within library contexts. The *Functional Requirements for Bibliographic Recordkeeping* (FRBR)[43] presented by IFLA in a 1998 report have been considered suitable for expressing these varying levels. It conceptualises (primarily creative) materials in terms of related entities, among which the most notable *work*, *expression*, *manifestation*, and *item*. Each one encompasses realisations, embodiments or exemplifications of the previous entity. Stakeholder entities are also defined, and these can be either corporate bodies or individuals. Further illustrating the demarcation between entities are the relationships that stakeholders have with each; they *create* works, *realize* expressions, *produce* manifestations, and *own* items. A fairly generic example of the terminology's application might be as follows:

Work: JRR Tolkien's *The Hobbit*

Expression: Tolkien's 1932 manuscript

Manifestation: The first edition, published by George Allen & Unwin, Ltd. Of London in 1937

42 See http://www.dml.indiana.edu/

43 See http://www.ifla.org/en/publications/functional-requirements-for-bibliographic-records

Item: A signed copy of the first edition, available for auction on www.ebay.com

Within the domain of contemporary art a classification might be presented as follows:

The Indiana model uses an alternative vocabulary but shares the concept of works existing on different logical and physical levels. Like FRBR, its means for relational description is mainly geared towards discovery, and does not represent a preservation approach *per se*. The project proposal document for a third phase of the *Variations* project explains that "this model supports dramatically improved functionality for searching and browsing of digital music collections over that of traditional Online Public Access Catalogs (OPACs) that offer searching of bibliographic records in the MARC format, and provides for linking of multiple representations of the same musical work at a structural level. Using these structural links, scores and recordings can be synchronized upon playback, and two recordings or two scores could be analyzed side-by-side to enable detailed comparison." The project is far from unique in its deployment of FRBR-like approaches for the description of creative works. The *Preserving Virtual Worlds* project[44] has been using FRBR in association with the Metadata Encoding and Transmission Scheme (METS) to distinguish and document related components and dependencies and to plan for their preservation within interactive digital media (most notably video games and networked social environments).

In 2003 the archiving team of the V2 organisation in the Netherlands spent several months conducting "research on the documentation aspects of the preservation of electronic art activities – or *Capturing Unstable Media* --, an approach between archiving and preservation"[45]. The result was the *Capturing Unstable Media Conceptual Model*, a tool intended to facilitate the documentation and reinstallation of new media art resources. It leverages the CIDOC (International Committee for Museum Documentation) Conceptual Reference Model (CRM) to support data interoperability and exchange between cultural organisations. Semantic web technology enables the production of open and machine readable vocabularies that can be deployed and tracked throughout a distributed context of archives. It support integration of documentation, the recording of user interaction with new media materials and the roles associated with multi disciplinary and collaborative art projects, visualised in a network hierarchy, and not as an inflexible list of credits.

Its philosophical approach demands a suitably robust typology incorporating the means to describe diverse contributing elements, including network facets, interfaces, associated electrical appliances, input and output devices, aspects of interaction, conceptual factors, configurable components and systems design. In contrast with the *Variable Media Initiative* its goal is not the medium independent characterisation of new media art materials, but instead the environments within which they are created and exist. Analysis of existing documentation and context surrounding two case studies yielded five primary conclusions:

- Electronic art projects, while considered in terms of their own facets and characteristics, are often part of a wider entity or process, such as a collection, exhibition or festival;
- Such projects often rely on a variety of materials and production processes;
- They are often collaborative, with multiple parallel or successive contributions;
- Documentation of interfaces between components is limited;
- There is little evidence of standard vocabulary for describing elements within electronic art.

CMCM offers a conceptual ontology of terms that are relevant to electronic media art, but with probable applicability beyond that domain [60, 61]. The first top level concept is a *CapturedThing,* which describes any aspect of an activity (in the field of electronic art) that has taken place or been created. This can be furnished with additional detail, and classified as one of either *Project*, *Occurrence* (Product or Activity), or *Component* (Physical or Digital). Further classifications enable the definition of more specific descriptors, encompassing specialist technological or physical component parts, or more detailed description of the nature of activities or artistic product. Secondly, the model defines *Documents*, which describes implicit concepts, and can be classified according to type (Digital or Physical) and associated characteristics (for example if it is text or video). Finally, the model defines *Actors* (those performing a role in a modelled concept), *Time* (associating a temporal dimension with modelled concepts), *Genres*, *Interactions*,

44 See http://pvw.illinois.edu/pvw/
45 See http://capturing.projects.v2.nl/

CopyrightStatements and *Keywords*. The complete class hierarchy is available in an interactive HTML format from the V2_Project website[46].

The *Capturing Unstable Media* project make a number of more general recommendations associated with conservation of electronic or otherwise unstable media art. The first relates to defining the object in question; it is essential in doing so to acknowledge both context and content. The former is often critical in determining value, particularly where an artwork is a part of a larger event or process. Objects, activities, actors, tools and components associated with content must also be recorded, with CMCM presenting a conceptual modelling approach capable of supporting this activity. Secondly, the project makes a number of recommendations specifically about the documentation process. Given the interdisciplinarity that often characterises digital art (with contributions from humanities, social sciences and technology domains) it is critical that concepts, objectives, design issues, deployed technologies and results of research or experimentation are made explicit in documentation. Likewise, discrete components must be described in terms of their operation and of any relationships they have with other system elements. The documentary goals will dictate whether the focus of documentation is the finalised art work, or the process that dictated its conception, refinement and publication. Documentation must in many cases incorporate instructions to support re-installation, as well as information describing the nature of associated collaboration and any legal or technical implications and descriptions of typical, anticipated or recorded user interactions. With respect to the latter, the project presents a nascent proposal for an interaction model. This incorporates elements associated with temporal aspects of interaction (dependencies or required synchronicity), the location of interaction, number of users (minimum and maximum), the nature of interaction (which may be observational, navigational, participatory, co-authoring or intercommunication) and the related sensory mode or modes, which might be for example visual, auditory, olfactory, tactile, or gustatory.

3.5 The Media Art Notation System

3.5.1 Introduction to MANS

In *A System of Formal Notation for Scoring Works of Digital and Variable Media Art*, Richard Rinehart explores opportunities for new approaches capable of characterising digital and media art materials [50]. Rinehart presents his work as summary, realisation and extension of efforts conducted by two leading projects both focused on responding to the problems associated with media art, the *Variable Media Network*[47], and *Archiving the Avant Garde*[48].

Rinehart describes the relationships between music and media art; that this relationship is more profound than any that exists between traditional art and the latter is a consequence of its variability, and its fundamental performative, or behavioural characteristics. What is the definitive expression of a piece of music? One might concede that there is no such thing, merely levels, or slices of realisation both conceptual and physical that considered together represent the *thing*.

Rinehart focuses instead on the most traditional means of representing music in an 'implementation agnostic' form – the musical score. This form, argues Rinehart, encapsulates meaning without reference to specific environments or technologies and is sufficiently transparent to facilitate understanding long after vinyl records or MP3 files are no longer interpretable. He proposes an analogous means of expression for new media art materials, despite conceding that a completely unambiguous new media art score is an impossible goal. Even musical scores are open to interpretation. We tend to value performances differently even where the piece, the performers and the venue are consistent. The (often ephemeral) reasons why are not necessarily implicit in the score. Nevertheless, in the absence of a perfect solution, a good solution is still nevertheless welcome. Rinehart's goal is the conception of a robust, flexible and scalable vocabulary and structure that is sufficient to describe objects, collections of objects, events and activities, expressing interrelationships, behaviours, choices, contingencies and variables. Furthermore, in common with a score, it must explain in minimally ambiguous terms, and in the absence of any other reference materials, how to re-perform or re-create the described work. In non-functional terms, its deployment must be standardised, transparent and capable of supporting both human and machine readability. It must also be accessible and cost effective to suit the limitations faced by those communities most dependent upon its success.

[46] http://framework.v2.nl/v2_archive/projects/capturing/cmcm/html/
[47] See http://www.variablemedia.net
[48] See http://www.bampfa.berkeley.edu/about/avantgarde

Like with most of the efforts described within this chapter, Rinehart's solution relies on syntax defined in XML, citing its low entry requirements, standardisation, scalability and machine readability. Of those existing schema explored in the course of his research he settles on MPEG 21, specifically its associated Digital Information Declaration Language (DIDL), as being of particularly relevance. He highlights a potential difficulty associated with DIDL (shared by related approaches such as SMIL), that its means of documentation is to some extent based around audience or end user perceptions of the described materials. Musical notation describes the performance of a particular piece, and not the experience of the listener. This might be considered the difference between primary and secondary documentation.

3.5.2 The MANS Vocabulary

Of the existing, generic XML schema available for media description and declaration identified by Rinehart he rejects SMIL and METS in favour of an approach derived from the MPEG-21 DID model. Nevertheless, the MANS model is not synonymous with DID, and rather than adopting the DIDL completely defines a set of guidelines that can be described as an alternative flavour of DIDL.

The conceptual model that provides MANS' foundation consists of a number of related hierarchical elements.

Score: MANS' root element is the score, a specific instance of the notation system.

Work: this element encapsulates the work as whole, although this is distinct from the artistic concept of 'work'. In addition to the exhibited 'physical' materials, this incorporates associated tangible and intangible assets and activities (such as talks or symposia) that are considered implicit parts of the work. Rinehart explains that "work is used in this model not to describe artistic processes per se, but to describe a work as a dynamic entity, a set of intents expressed as parameters or choices and manifested as a product or occurrence".

Descriptor: this element is used to encode documentation that is extraneous to the work, while still descriptive of it. Instances can exist at any hierarchical level, to describe the work as a whole or to describe discrete component parts.

Version: used to denote a specific instance, account, state or occurrence of a work, this element accounts for the dynamism that is frequently demonstrated by new media art materials, which may be exhibited in multiple locations, in multiple forms, and comprised of multiple component materials. Versions can be real, which reference tangible installations or exhibitions of the work or logical, which may describe those envisaged by the artist for the future.

Part: this element provides a means to reference components or sub-components of individual versions, distinguishable according to function, and not to more physical or tangible characteristics. Those material assets are instead referenced as Resources within MANS. The value of distinguishing parts according to their logical or functional role promotes the persistence of behaviours as of critical importance, irrespective of the inevitable obsolescence of time-dependent material assets. Furthermore it permits more meaningful accreditation of contributions in collaborative pieces, and enables the application of more granular documentation.

Resource: this element is used to denote those physical or in some way tangible building blocks that together comprise a work. They may be physical items such as an LCD display, or more logical resources, such as a digital image file or Java program. MANS recommends that each Resource be accompanied by a Descriptor indicating optimal preservation strategy(ies), suggesting that it is at the level of discrete Resources that preservation is undertaken. This is to some extent true, but one could similarly argue that preservation is more focused on maintaining logical Parts of the work, irrespective of specific Resource considerations, which may be interchangeable (e.g replacing a combination of hardware components with a single software software solution) throughout subsequent preserved iterations. It is suggested that the relationship between Parts and Resources could be made more explicit, in order to relate proposed preservation solutions (or, much more usefully, potential preservation risks) to both logical and physical aspects of the overall work. Digital Resources, such as software code and media assets can be included within the MANS score, which supports inline embedded and referenced bitstreams encoded as Base64.

Choice: this element incorporates those variables that can affect the nature of a work's presentation, or the manner within which it is engaged. They determine the breadth of parameters associated with such changes – the extent to which flexibility is available, the identities of those permitted to exercise the choice and a default selection, determined usually by the artist. MANS specifies a recommended series of authorisation roles with decreasing capacity for flexibility,

including artists (most discretion), contributors/agents, hosts/owners, presenters and public (least discretion).

Condition: this element specifies circumstances within which particular Choices, Parts, or Resources are optional or mandatory. The syntax permits logic and the construction of complex decision trees.

Annotation: this element incorporates notes that are neither part of the work nor the accompanying documentation. A typical use would be to record a discussion about a particular part of the score. One might consider this to resemble metadata about metadata.

Descriptive Metadata: MANS uses Dublin Core, encapsulated within DIDL Descriptor elements to record descriptive metadata. Different terminologies are defined by MANS but mapped to DC elements as follows:

MANS Descriptive Metadata Term	Corresponding DC Element
type	type
date	date
title	title
measurements	format.extent
subject	subject
creator	creator
contributor	contributor
host	publisher
identification	identification.number
version	relation.version
language	language
location	identification.location
authorization	rights

Table 4: Mapping of MANS Descriptive Terminology to Dublin Core

Among the DC elements discarded from use within MANS, three are given specific coverage. DC FORMAT is omitted since new media art seldom incorporates only a single distinguishable format, with hybridity a frequent characteristic. The MANS Resource element is considered a more appropriate vehicle for expressing format information. Similarly, it is argued that the DC RELATION and DC DESCRIPTION elements are largely usurped by the MANS provisions that enable greater and more granular associations with individual components of the overall work.

3.6 Forging the Future: New Tools for Variable Media Preservation

Forging the Future: New Tools for Variable Media Preservation[49] is an ongoing project committed to the creation of preservation and documentation tools for new media materials. Comprising a consortium of museums and galleries, the project has spearheaded the development of three primary tools for supporting preservation of variable media materials. The first is the *Variable Media Questionnaire*, already discussed in a preceding section. Forging the Future is aiming to extend the functionality of this online resource, which is focused on the future presentation of established works, in a manner compatible with and representative of their implicit meaning. The second, the *Franklin Furnace Database*, is more retrospectively focused, providing electronic means for cataloguing established works based on a central events database. Further associated databases can be populated to enrich the record, offering coverage of names, contacts, images, audio and video footage, related publications, related terminology and vocabulary, and reference materials. The final tool, the *Digital Assets Management Database* facilitates a top level coverage, and is used to manage information about any digital documentation assets that have been created corresponding to works. For example, any digital images captured of a particular installation would be described in DAMD. Links are established between DAMD and the corresponding works in FFD or the VMQ. MANS descriptions are utilised throughout, particularly to facilitate interactions between the three tools. Forging the Future is expected to release its results in the near future.

[49] See http://www.forging-the-future.net

4. Art Conservation Practice and Planets

4.1 Summarising Opportunities for Contemporary Art Conservation

Whereas those committing considerable intellectual investment have sought to align the problem of digital preservation with the challenges faced within traditional records management, archiving and librarianship domains, comparatively little work has concentrated on its relationship with art conservation and restoration. While the creative domain is increasingly coming to terms with art works with digital characteristics, and fraught with the accompanying issues of obsolescence and potential inaccessibility, they are comparable with many of the problems that have been faced for some time by conservators of contemporary art more generally. Contemporary art has presented combinations of unstable media, comprised of bespoke components, and encompassing complex and often impenetrable meaning often dependent on disproportionately tiny characteristics. We have heard many times of the seemingly arbitrary way in which minimal technological disruption or loss can have catastrophic implications for access to digital materials. The removal or alteration of a single bit from a PNG file's header section can dramatically alter or destroy the rendered file. Likewise, a restoration process for contemporary art that replaces a material component with a seemingly equivalent alternative may fundamentally alter or detract from its creative value.

Modern Art: Who Cares? presents three primary reasons why the challenges associated with contemporary art conservation remain distinct from those faced by conservators of canvas, platter or plinth art [4].

1. The extreme fragility and unpredictable ageing of the often highly unorthodox materials used.
2. The different role of materials and the creation process in the meaning of the work compared with traditional art.
3. The lack of historical distance resulting in an interpretation of the work based on a feasible consensus is not yet possible.

One might describe the challenges of preserving digital materials exactly the same way. It is self evident that the first issue is common to both; digital materials are objectively more easily destroyed, or divorced from appropriate representation mechanisms (as good as destroyed) than their physical, analogue counterparts. This is an undisputed truth. The second issue can be considered in light of the culture of innovation that continues to characterise our use of digital technologies. 'Meaning', more or less synonymous with our community's favoured phrase, 'significance', is increasingly difficult to trace within the digital context more generally, as multi media and multi modality are increasingly visible fixtures across the entire landscape of information creation and consumption. Users' perceptions of elements within Internet web pages and their respective importance have changed throughout the short lifetime of this platform. The Internet, once primarily a platform for publication has evolved into a much more experiential phenomenon. Interactivity, for so long an ancillary part of the web browsing experience, has become core. The culture of conversation between individuals and systems, facilitated with web based resources is now commonplace. Tools are being used in diverse, often experimental ways, even within mainstream digital contexts.

Finally, both phenomena have in common the immediacy with which they are exposed to risk. Paintings, sculptures and published manuscripts each enjoy a reasonable 'grace period' following their conception, within which one can assume their survival without intervention. Only latterly, when the effects of time take their toll must conservators ensure their preparedness. This period offers relevant stakeholders plenty of opportunities to determine meaning, significance or value that must be maintained. In contrast, digital materials, like much contemporary art, demand often immediate action, within a far shorter time scale. Considerable onus is placed on the anticipation of future use, with minimal experience available to reference in one's characterisation, and subsequent preservation action decision making. As soon as a *Microsoft Word* document is created, a digital preservation practitioner might identify associated vulnerabilities and seek to implement an appropriate preservation strategy in response. But the question of whether a proposed format migration to PDF is appropriate and sufficient to maintain every worthwhile aspect of the digital object's value will probably be determined only sometime in the future. By that time the original may be no longer accessible.

4.2 The Artist's Role… The Creator's Role

Numerous questions surround the value of artists' contributions in the determination of meaning, and the conception of appropriate preservation or conservation approaches. The previous Planets deliverable that explored these issues (PC5-D1) suggested that the artist should have a role but that one should remain wary of regarding theirs as the sole definitive view. Their perspective at the point of conception is compelling (probably uniquely so), but once free of their creative grasp, the artwork and creator become divorced, the exclusivity of their relationship is no more.

As the *Modern Art: Who Cares?* report states, "the work and the maker are not interchangeable", and this view appears to be broadly adopted [4]. A piece's meaning is established by a curator with reference to the artist's contribution, not exclusively on the basis of it. Artists can contribute more information about a piece's origins, inceptions and assembly than any other. But they cannot claim sole knowledge of what it has become since leaving their custody. Art historians and curators are responsible for such interpretation. "The fact that artists are not the best spokespersons on the meaning of the their work is already apparent from their decision to express themselves in an art work in the first place" argue the authors of *Modern Art: Who Cares?* In the event of an artist's death or non-availability, it need not be the case that the associates, kin or estate of an artist are best equipped to comment on the meaning of his or her work.

Nevertheless, many argue of the criticality of artist intervention at every stage of the conservation process, and this may be realised by reference to the results of initial dialogue, or through an ongoing conversation. Sometimes artists are unavailable to assist in the ongoing interpretation of meaning and of discrepancies between condition and meaning. The following anecdote is recounted in the *Modern Art: Who Cares?* project report:

> "A few months ago, the Van Abbemuseum displayed Suchan Kinoshita's work *Show*. After the exhibition, we spoke with her about the possibility of purchasing the work. Naturally we wondered how to display the work without her direct participation, how to preserve it and whether parts could be replaced. Kinoshita was immediately prepared to discuss this with us and proposed writing a sort of 'musical score' in which she would write down exactly how the work is to be installed and 'performed', who can take what liberties, and who has what obligations. She also proposed the appointment of three 'godmothers' who would stand by and assist the museum in the event of installation or maintenance problems. The godmothers are also responsible for their own future successors. [4]"

The viability of such provisions is debatable, but nevertheless the possibilities are appealing. For many, Richard Rineharts's MANS has established itself as capable of performing this role, providing grounds for optimism [50]. One might be less confident that artists will happily take the time to conceive comprehensive documentation to facilitate the ongoing availability of their work. There is little to suggest that any kind of consensus exists among artists on the value of documentation. Discord exists even within the rather extreme 'destruction art' community. Destruction artists Al Hansen is representative of many of his peers, remaining sceptical of the value of documentation, and writing that "a weak facet of destruction art is when it gets to be a record of what happened. The product must surmount the process. With a good piece of art it doesn't matter what camera took the picture or who did it"[24]. Nevertheless, despite the apparent contradiction between preservation and destruction, many artists within this domain regard documentation as an essential facet of what they do, the only means to ensure that the meaning of their work transcends the few that witness the transience of their work.

The curator of the *That Was Then and This is Now* exhibition at Harvard University's Center for Government and International Studies in April 2007 explained that despite the exhibition's destructive themes "through documentation, we can rethink these works or revisit and appreciate the work that went into realizing them rather than a painting which is painted and then continually exhibited". Contributing artist Enzo A. Camacho agreed that it is "exciting for me to have the opportunity to show the piece after it self-destructed"[41].

Contrasting views persist from artists. In an interview with Lydia Beerkens and Christiane Berndes sculptor Tony Cragg absolved himself of a role in the conservation process; his job was to create the art, he should not be involved in its conservation or restoration years down the line. "The artist makes the art work and does that but once. You can't make the same work again twenty years later" [26]

One might argue that digital materials are not all created in the same way as art – that there is not the same personal or creative investment in typical digital materials that goes into the conception of

a work of art. But this perspective misses the point – the critical contribution that an artist might make is associated not with the nature of his or her investment, but with the extent to which their perspective of significance is definitive. The creator of a *Microsoft Word* document or Internet webpage is similarly well positioned to comment on aesthetic, semantic and functional qualities that might be considered definitive, and also to comment on the extent to which these features are adequately maintained throughout preservation iterations. That is why work already undertaken in Planets exploring usage and collection models, and monitoring the habits and emphases of those contributing to the information lifecycle remains critical in the conceiving appropriate preservation responses. But nevertheless, although the user or creator's perspective is vital, there is further value in considering the question of objective value associated with specific digital materials.

4.3 An Objective Approach to Preservation – All Things to All People

Within a mainstream preservation context, our characterisation efforts have tended to mainly focus on the user experience, specifically those uses required or expected by identified associated communities. In the language of Planets, Plato determines the applicability or success of particular preservation strategies by reference to objective trees; expressions of users' priorities associated with example digital materials [56]. In OAIS terminology the Designated Community is a conceptual and real world grouping that provides a means of capping archival responsibility, a way to limit preservation planning to that which is necessary to ensure the adequacy and interpretability of information [11]. It is use (and anticipated use) that we primarily reference when collecting representation information, and when assessing the success of implemented strategies. This has seemed a natural and appropriate way to approach the process of preservation, and specifically characterisation. But there may be some value in reversing our thought processes, in order to think not in terms of what users expect from digital resources, but what those resources actually provide in a more objective sense. To do so is more immediately appropriate for experiential materials where data and function are less easily distinguishable. It also implies a more extrinsic perspective to not only the object itself, but also the context that shapes it.

If we consider the typical approaches that characterise the provision of long term access to video games we can see evidence of this approach. When seeking to provide users with an authentic "Pac-Man experience" one can not approach characterisation by conceiving an exhaustive list of every facet of user expectation. Irrespective of the adopted level of granularity, simply listing discrete experiential components such as "avatar control", "X-Y movement through delineated corridors", "consumption of items" and "avoidance of pursuing phantoms" is a poor means of planning the realisation of an equivalent overall user experience. A better approach requires consideration of such materials as a whole; of what the game *is*, in as objective a sense as possible, and not simply in terms of how it is interpreted or interacted with. An emulation approach is better equipped to encapsulate such materials because its method of preservation binding doesn't depend upon characteristics that fall within the original object's semantic or aesthetic perimeter. Its focus is in recreating an environment within which the *original* material can continue to exist. Migration in contrast is inward looking, requiring the identification and recreation of discrete *perceptible* component parts (distinguishable by user demands and habits), and their reassembly in an alternative form. Where one's preservation goal also includes the adding of value to original materials (what is often described as *curation*), consideration of integral characteristics is necessary to facilitate their evolution. But where simply preserving a consistent experience, the goal is to ensure that irrespective of contextual changes, the experience is presented in a form that is minimally distinguishable from the original. In turn, validation becomes more straightforward, as the onus shifts from the individual validation of every valuable property to the identification and assessment of aspects of performance that fail to meet expectations. Naturally, In those situations where the user's role goes beyond mere 'passive interactions' and they become part of the thing's value, then that role must be encompassed within an overall conceptualisation. Emulation style approaches demand the formation of a perimeter around everything that contributes to the information, experiential or creative expression. This can be extracted and redeployed in a new environment. The very definition of significant properties might be shifted from being about data to being about the environment; instead of considering the must-have characteristics of data, one may instead consider the characteristics of the system (technical or otherwise) that must remain available to facilitate their appropriate representation. Needless to say, emulation is in practical terms not simple, with integral experiential factors dependent on aspects of context. The performance achievable by executable materials will for example depend on the platform and its interaction with the emulator. But any preservation interventions will be at this interface between new platform and emulator; the original asset (an executable file for example) will be unchanged.

Where contextual and participatory factors contribute to the digital material, the characterisation process is likewise more onerous. Characterisation for emulation is a process of determining the perimeter that surrounds that which is of value. Inevitably some components deemed to be not particularly valuable may find themselves within that perimeter. Migration characterisation is a process of selecting that which should be retained, perhaps irrespective of the form within which it was originally packaged. One cannot feasibly emulate a fascist, wartime socio-political context tofacilitate contemporary interpretation of Picasso's *Guernica*. But documentation can describe the culture that informed the piece and enable its continued appreciation. Those circumstances within which the characterisation of entire systems is more feasible than that of associated objects may appear limited, but there is a great deal to suggest that the balance will shift as means and methods of digital publication becoming increasingly diverse.

4.4 Mainstreaming the Discussion: Planets XCL

4.4.1 Introduction to XCL

The eXtensible Characterisation Language is a Planets-endorsed means for describing digital materials in implementation-agnostic, but machine readable terms, intended to facilitate automatic regularisation of diverse file types [2]. It consists of two primary parts. The first is the eXtensible Characterisation Extraction Language (XCEL), an abstract data model to support machine readable file format descriptions. Its role is similar to that performed by the Data Format Description Language (DFDL), although DFDL is more concerned with scientific data structures than file formats. The second is the eXtensible Characterisation Definition Language (XCDL), a description vocabulary and format, in which digital content can be encapsulated following processing with a bespoke extractor application. XCDL offers the ability to compare two objects that although originally encoded in different file formats nevertheless share the same XCDL characteristics. Two files depicting the same image, encoded in TIFF and PNG formats respectively, can be compared using this abstract modelling approach. Format conversions can be evaluated and significant properties' persistence automatically validated.

Two associated software applications facilitate the process of encapsulation and validation. The XCL *Extractor* takes an XCEL expression of a file format, and a data file encoded using that format as its input, and is capable of outputting a generic representation in XCDL. A *Comparator* application performs the validation between XCDL representations of objects, most obviously (for preservation purposes) a source and migrated preservation output.

4.4.2 Related Work

Considerable work has focused on the issue of significant properties, both within Planets and further afield, perhaps nowhere more notable than within the inSPECT project[50]. The latter has sought to extend the notions of source and process within the performance model defined by the National Archives of Australia, an affirmation of the importance of not only data objects, but also the platforms and environments that facilitate their interpretation and representation [25]. A critical outcome of the project is the conception of a framework for the definition of significant properties, enabling the analysis and cataloguing of significant properties, as well as their quantification and validation. The project group aimed to define a relatively small set of information elements (comparable to the Dublin core metadata standard) to facilitate these goals. These were defined as follows:

propertyTitle: the property's title, and indicative of its purpose;

propertyDefinition: a statement describing the property's purpose, human-readable and stored externally to the metadata record;

propertyIdentifier: machine-interpretable identifier;

functionClassification and **functionDescription:** respectively, a classification from a controlled vocabulary indicative of high level function (e.g., Content, Context, Structure, Rendering or Behaviour) and a free text description of function;

significanceLevel: a representation of the property's significance in terms of the record's recreation / re-representation;

50 See http://www.significantproperties.org.uk

designatedCommunity: a term from the Reference Model for an Open Archival Information System, providing an opportunity to associate particular properties in a non-global fashion, with relevance only to particular communities;

location: the layer at which the property is applicable;

propertyType: indicator of the type of constraint, can be equality, minimum or maximum

propertyUnit: unit of measurement for the property;

propertyValue: the measured value or an external location in technical metadata where it can be found;

propertyReason: a free text field legitimising the constraint;

communityConstraint: this element enables the association of particular constraints with only specified designated communities [36];

The adoption of the Performance model implies a distinction between raw data (source) and the interpretative environment or interaction that effects its representation (process). inSPECT explored significant properties in these terms for four primary information classes, structured text, emails, digital audio and raster images. Further work within Planets has acknowledged the issue through the work of the Digital Object Properties Working Group (DOPWG). One proposal has been the development of a dynamic OWL (Web Ontology Language) model for mapping significant properties to digital information, offering authoritative definitions of XCDL properties, explicit relationships that exist between properties (facilitating cross comparison between alternative vocabularies) and machine readability (in Resource Description Framework RDF) [46].

Planets has undertaken considerable work within its Preservation Characterisation and Planning sub projects to investigate the range of significant properties that may be relevant for a range of digital materials. Within the context of the latter, the Report on Policy and Strategy Models for Libraries, Archives and Data Centres outlined a conceptual model and vocabulary for approaching preservation within an institutional setting. Implicit concepts for preservation planning and strategising are Preservation Objects, Environments, Environment Components, Characteristics, Preservation Actions and Requirements, encompassing contextual and functional considerations, and not simply intrinsic object characteristics. An Environment, consisting of several Environment Components is defined as “the set of factors which constrain a *Preservation Object* and that are necessary to interpret it” [16]. Clearly, the interpretation of the extent of factors that contribute to this concept can be broad or narrow. Within digital art, and any materials with fundamental functional and contextual significances, it must be more than just format and data carrier, extending to associated representation methods, the nature of user interaction and the (potentially full) range of contextual factors described above.

4.4.3 Limitations of XCL for Dynamic Materials

Currently, the XCL approach appears primarily targeted towards file formats, and seems to be of most obvious use in supporting the validation of migration-based preservation. The XCEL structure is based upon the assumption that “any file format can be expressed as (a) a set of hierarchies of blocks of content, all of which can (b) be addressed from within but also out of these hierarchies”. The biggest barrier to XCL’s wider deployment is its apparent perception that every characteristic of digital information is encapsulated within the file or collection of files that comprise it. There appears to be an assumption that every aspect of structure and semantics can be determined by reference only to the file. Therefore, although we hear that the extractor is capable of expressing “the complete informational content of a file in a format independent model”, there appears to be no way to encapsulate behaviours dependent on external factors, such as characteristics of an associated rendering environment. There is little about a digital file that is self evident. When XCL expresses a specific *imageWidth* attribute for a PNG file the semantic significance is partial, and necessarily speculative. Of course, the potential behaviours associated with image files are more often than not quite simple – one would expect that most generic viewers would display image files identically. However, when objects begin to demonstrate increasingly complex behaviours, beyond the fundamental ‘render’ behaviour exhibited by images, the rendering environment’s characteristics are more critical. The same package of web content (HTML plus image files) may appear and function very differently when accessed in Microsoft Internet Explorer and Mozilla Firefox. The changes in look and feel can be even more dramatic when the underlying operating system varies. A single MS Word file viewed in *Microsoft Word 2007* and *OpenOffice.org* might exhibit considerable differences in layout and behaviour. The very concept of “authentic” access is fundamentally dependent on the representation environment. If there is such a thing as an

authentic performance it is probably debatable on a case-by-case basis, but nevertheless, where behaviours are at all variable depending on platform characteristics, authenticity cannot be independently determined by reference to only files.

Similarly, context is of tremendous importance, and is not best served by XCL in its current form. The database preservation research domain provides a compelling example. When seeking to preserve databases one must go beyond the simple recording of its status at an arbitrary point in time. This presupposes more than simply table and column names, types and encodings, and implicit data. Peter Buneman identifies the dynamism of databases as among their most interesting characteristics [71]. Buneman's database definition of 'any evolving collection of data that has some kind of internal structure' makes explicit his feelings that *evolution* is fundamental to the database. A suitable solution must take into account the issues associated with live databases (those constantly subject to queries, inserts and updates); The term *database* suggests a living entity; is a dead or decommissioned database still a database? Is the final version of the database the only one that is likely to be of interest? Clearly there may be interest in determining when a particular record was changed, or the status of a field at a hitherto unknown point in time. The evolution of (particularly interactive) works of art over time can be considered analogous and requiring additional means of contextual classification across a temporal dimension.

So, because of the inherent multidimensionality associated with digital art materials, a characterisation approach based only on implicit files is inadequate. That is not to say that XCL has no role in this process, or preservation characterisation more generally, but it must be part of a wider documentary infrastructure that also encompasses those components that contribute more to information *behaviour*. In presenting the XCL, distinctions have been made between characteristics associated with both files and objects. XCL targets file characterisation, with an object seemingly loosely defined as a convenient means of encapsulating one or more related 'literal' files. For most materials that exhibit even marginal levels of complexity, the object must mean more. The Reference Model for an Open Archival Information System specifies several objects (that may be synonymous) that each perform a role within the OAIS processes of ingest, archiving and access [11]. Each is packaged with a variety of metadata, including representation information, which loosely defined incorporates any information required to ensure the information is usable and interpretable by its specified designated communities. This will likely encompass information about the technical characteristics of files being preserved, as well as relationships that exist between multiple intrinsic files. However, in addition it will include information about the context within which that content is (or can be) interpreted, consumed or rendered, which may incorporate software or hardware specifications, means for semantic decoding (including ciphers, or language information) or operating instructions. This model is better suited to digital art materials that have a meaning dependent upon *what* they are in physical or conceptual terms, and also on *how* they should be deployed. In this respect, XCL is comparable with an encoding scheme such as METS[51], which is primarily concerned with describing digital objects in terms of what they are, and not what they do. 'Physical' object authenticity is no doubt demonstrable by reference to such materials, but validating the acceptable preservation of experience needs something more. There is considerable acknowledgement within Planets of the limitations associated with a strict file-format oriented perspective, and much work being undertaken to develop a complementary approach capable of encapsulating both intrinsic and more functional significant properties.

Chris Rusbridge argues that preserving every aspect of function is an impractical goal, writing that "digital objects (viewed as data structure plus mediating software), have a huge number of possible behaviours" and that "it is likely that the majority of preserved objects are very little (or perhaps never) used" [52]. In the pursuit of more cost effective preservation infrastructures, and assuming the retention of original bits, Rusbridge argues in favour of managing expectations to retain every aspect of functionality. His proposed solution follows work done at California Digital Library, the production of desiccated versions of data that retain some key properties rather than seeking to retain everything. By keeping original bitstreams the onus for making accessible more niche properties is passed to the information consumer. The conclusion may be sensible, but appears to be largely on the basis of cost information that the preservation community has not yet made any serious effort to accumulate. There can be no more natural place than this (a report on emerging characterisation approaches) to argue in favour of the comprehensive characterisation of digital object functionality. Though this is *not* the appropriate place to dwell on the specific approaches that might make preservation of all functional aspects genuinely feasible (although emulation would appear to be a good start) we should try to at least *describe* everything that is useful. And if we are

[51] See http://www.loc.gov/standards/mets/

smart about the conceptual level at which we do this, we can perhaps save ourselves work, and maybe even limit costs. Give an information consumer the choice between four solutions that each offer a quarter of the functionality of an original object, or a fifth alternative that *is* the original object, one would naturally expect him or her to choose the latter. If we can prove that the associated costs are comparable we have no reason not to offer this alternative. If the situation is such that we are actually compelled to offer more choices each with proportionately less original functionality then our case grows stronger still.

In our preservation endeavours, we only strive to characterise that which may be lost. Likewise, we don't point out the value of properties as an end in itself, but as a means to validate the success of adopted preservation approaches. The number of properties that one might choose to identify varies according to the material itself. At one extreme one might identify bitmap images. Their characterisation appears to be relatively straightforward, with minimal associated behaviours (assuming the vast majority of uses) where representation is unlikely to amount to more than visual rendering. Nevertheless, the introduction of even modest flexibility sees a disproportionate growth in cost and complexity. For even comparatively trivial document style materials we have near limitless potential associated behaviours depending on the associated representation platform. The identification, quantification and validation of significant properties costs money – to approach them in a piecemeal fashion may be counterproductive. Instead of describing every single example *Microsoft Word* format document, why not commit resource to the conception of rigorous, richly defined functional descriptions of principle word processor platforms, capable of informing subsequent preservation strategies that are aimed at their preservation? Putting function, and not physicality at the very forefront of our characterisation activities might appear to cost more in the first instance, but given that in contemporary digital society we have two primary platforms (notwithstanding historical versions that exist) versus millions, billions, or perhaps even trillions of individual documents, the system level characterisation appears more attractive, and perhaps even cheaper over the medium to longer term. Necessarily, the optimal characterisation languages must focus at least as much on process as source within the overall performance model. How source and process are related must also be explicitly defined within such a model.

4.4.4 Requirements for a Planets Characterisation Language for Digital Art

The conception of suitable means for characterising digital art, equipped to deal with both intrinsic and contextual qualities, and also capable of meeting requirements in more mainstream preservation situations, is challenging. A number of solutions already exist, and can be to a certain extent leveraged, but a Planets solution must interface effectively with existing characterisation tools, most notably XCL. In a previous section it was suggested that XCL in its current form has a great deal in common with METS, with both approaches primarily aimed at objects, and not necessarily function. Richard Rinehart describes the value of MPEG 21 Digital Item Declaration Language when he writes "if METS preserves objects that are acted upon through various behaviours contained in software, DIDL can instead preserve behaviours that are expressed through various objects like files, equipment and software… If METS best describes what an object is… DIDL defines the parameters that affect what the object is and what the object could be" [50]. Rinehart's priority has been the development of a scoring notation for media art – a necessary precursor to that goal is an adequate means for characterising both object and the contextual dependencies and priorities to safeguard consistency and completeness of meaning. Rinehart provides compelling justifications for his adopted approach, and the mainstream preservation community can take a great deal from MANS. For digital art at least, an XCL oriented approach demands accompanying means of expressing function and context as well as more file format-centric properties. XCL, while directly addressing the description of the source part of the performance model appears less well equipped to deal with the description of associated process.

A further requirement is the definition of appropriate experimental approaches to validate functional persistence, in a manner comparable with how the Planets Testbed and Plato currently validate other machine interpretable properties. How can one quantify the values of properties associated with those softer functional and contextual qualities that are less easily defined? For some contextual issues that are beyond the realistic scope of preservation these metrics and approaches must also be able to identify the appropriate pursuit of what can realistically be done. So whereas recreating a particular cultural or political context may be impossible, its documentation using appropriate materials might be evaluable.

The principle outcome of this work will be vocabularies sufficient of filling in those aspects of preservation characterisation less well served by current Planets provisions. This should facilitate the expression of every important aspect of interactions between file format, representation

environment, user and context. The extent to which these can be preserved is to some extent moot within this research, but the intention is to present a technology agnostic range of documentary resources capable of ultimately supporting the redeployment of the information objects without loss (although likewise supporting more lossy preservation activities).

A number of critical non-functional requirements are also self evident; the model must be logically and semantically capable of interfacing with XCL and existing Planets tools, including Plato and Testbed, in order to facilitate the validation of described properties. This naturally implies its definition in XML; whether MPEG 21 DIDL or semantic web approaches such as RDF OWL are more appropriate might be debated. Planets is already in the process of exploring opportunities with OWL to support characterisation and preservation validation through ontologies, and from the perspective of this work package an alternative DIDL-oriented approach is considered to be a worthwhile accompaniment. Similarly, the outcome should be compatible with the information model outlined in the OAIS Reference Model. In so far as is possible the model should support automation as far as possible, to limit required expert interaction, although as noted above the creator's perspective should be leveraged where possible to offer definitive perspectives on information significance.

4.4.5 Further Work

Further efforts within this Planets work package will evaluate the applicability of those existing means for functional and contextual property classification already identified within this report. A definitive model for characterising the many relevant facets of new media materials capable of integrating or interfacing with existing Planets approaches will be conceived to support the existing XCL and ontological provisions. In order to undertake this evaluation an appropriate means of property validation will be conceived for use in non-automatable cases.